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Plain Speaking

IN his article on the Installation Problem this week, Mr. W. R. Rawlings makes a remark which would be considered important at any time, but which is particularly so when our readers are discussing what measures should be adopted, or what methods should be changed, to bring about increased electrical development.

He says that if electrical men hesitate to say what they think, because they are afraid of upsetting somebody else, or because they do not like to run the risk of their ideas being knocked down or proved to be wrong, very poor progress will be made. He appeals for free and frank discussion of his subject and the abandonment of dogmatic and hitherto immovable prejudice. We do not hesitate to declare ourselves in complete agreement with him. We have made some plain statements ourselves, and we welcome views from all sides, for we have some sympathy with the old saw: "One man's word is no man's word; justice needs that both be heard."

The electrical installation section of the industry has been Mr. Rawlings's special sphere as long as there has been an electrical contracting industry worthy of the name and organised to negotiate with other parties. As the "father" of that branch, and now president for the third time of the Electrical Contractors' Association, he, if anybody, is surely entitled to call for freedom of speech regarding matters which many authorities keep on saying ought to be set right without further delay.

It is observed that while the Home Office imposes a high standard of work and efficiency of control for industrial installations, everybody in the domestic and rural fields may do pretty well as they please. Deplorable confusion results. "Individual fads and fancies have been the curse of the electrical industry far too long." The remedy for all this is a change to collective opinion and decision if the right end is to be reached for satisfactory domestic electrification.

A definite collective view can only be arrived at from the free expression of views reached as the result of individual practical observation.

In effect our writers are asking: "What is the use of saying the same old things again and again, if we mean to get things done? Why can't we *do* something?" Some of our recent contributors have been delightfully fresh and unconventional in the expression of their views. Their obvious freedom has been helpful in stimulating discussion. There is a regrettable indisposition to write under one's own name, just as there is an indisposition to speak in public, because "I am connected with so and so, and therefore can't risk being misunderstood."

Mr. Rawlings comes right out into the open and sets forth his convictions as formed through the study of facts arising in actual practice, with the desire to aid in the simplification of the installation problem. He appeals for the domestic situation to be discussed from the practical and not from the academic point of view. He states his convictions, and nothing better can happen than for those interested to set against them any convictions that they, too, may have and discuss them fully and without unnecessary restraint, in our pages.

The need for an ample supply of " points " has been emphasised already in these editorial notes. Mr. Rawlings indicates how these should be distributed in the ordinary villa type of residence which is occupied by the bulk of the people likely to make really comprehensive use of electricity. He describes the ordinary fuse, which innumerable householders find a perfect nuisance, as " simply a survival of primitive barbarism," and advocates a simple type of overload release or calibrated fuse-board that cannot be tampered with. The desideratum is to protect the supply from unreasonable demands, to secure the safety of the consumer, and to teach him to use his installation with due care and understanding.

It Won't Sell Itself!

WE are continually receiving evidence that if electricity is to be used with confidence there must be simplification both of the installation and of the tariffs employed in selling it. As Mr. Wilson said in his article last week, the removal of irksome restrictions, and the offering of rates that become more favourable with increased use, are essential for the development of the domestic load. Most non-technical users of electricity become bewildered by the mass of unintelligible and unnecessary matter with which they are faced when they ask for a supply. This week, in our " Correspondence " pages, Mr. Wilson suggests the compulsory use of a universal tariff fixed by some national body at a uniform rate for each of the grid districts, but he thinks that our backwardness is largely due to the lack of desire on the part of authorised undertakers to sell cheap electricity for domestic use. It is perfectly true that there are some areas in which departments appear to be afraid to do anything startling because they might be inconvenienced if new demands came on at too rapid a rate. There are still amongst us some who prefer to hold that electricity is so good a thing that it will sell itself; that canvassing and advertising are so much waste of money. We are glad that all views are being expressed, but it will hardly be expected that we shall subscribe to this one when we have such striking evidence of the remarkable success that has attended the adoption of a thorough-going business-getting policy, with systematic canvassing and attentive service, in a number of places.

Maintain Co-operative Effort

MR. C. G. MORLEY NEW, greeting the members of the I.M.E.A. in the December report, takes the opportunity to press the claims of " co-operative effort in publicity, research, and standardisation "—abstract nouns of which the concrete counterparts are the E.D.A., the E.R.A., and the B.S.I. (formerly the B.E.S.A.). In this he follows the example of previous I.M.E.A. presidents, but, whereas in the past such exhortations have been reserved for the summer convention, delay in the present circumstances might be dangerous. Every opportunity should be taken to bring home to those ultimately responsible for financing these bodies that it is possible to effect savings which are no economies, and which may, indeed, result in serious loss.

Transmission Systems

IN the comparisons drawn between the high-voltage systems of Italy and our own grid during the I.E.E. discussion on Mr. A. Dalla Verde's paper, an important distinction between the two was not touched upon. In addition to the point (on which comment was made) that the first is mainly a true transmission scheme, in which the load is situated at some distance from the power stations, whereas the other is primarily intended for the interconnection of stations, there is a fundamental difference that accounts for some of the divergence in practice between the two countries. This difference is that the Italian system has grown up over a long period and has been designed by bodies with supposedly conflicting interests, while the British grid has been designed from the outset as a comprehensive whole. The existence of spare capacity in the independent lines in Italy has made interconnection unnecessary at the present stage except to compensate for difference in seasonal water conditions, but the situation is to be reviewed when it becomes necessary to exploit generating plant capacity more fully. There is much to be said for the simplicity of a radial system of *transmission* up to the time that load developments make an interconnected system economically desirable.

The Intermediate Stage

THE question has sometimes been raised as to how far the design of electrical apparatus, notably cookers, has been influenced by the fact that electricity came after gas in point of time. In many parts of the countryside there has been no intermediate stage of " that beastly commodity known as gas," to use the words of Alderman Harry Leese in drawing attention to this feature of rural electrification at the annual dinner of the N.W. Midlands branch of the E.A.W. This freedom should provide an opportunity for gaining experience in the development of apparatus designed solely for making the most of those advantages of electricity that are shared with no other heating method.

Still Going Strong

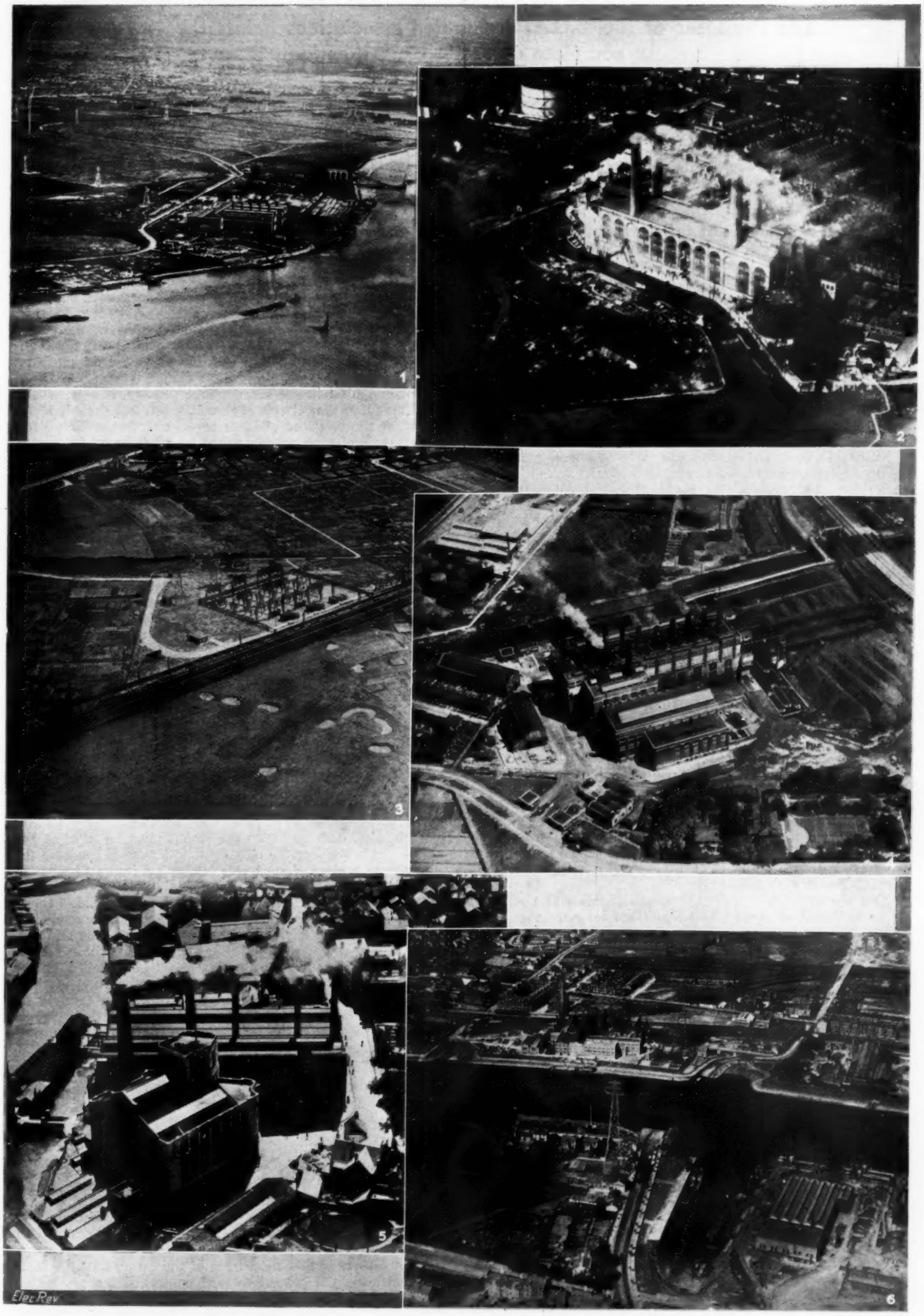
CONTRARY to the experience of many supply authorities in industrial areas, Birmingham's sales to factories and workshops made an advance last year. This is attributed, to a large extent, to new business which has been secured lately, and it speaks well for the thorough-going methods employed by the Department in convincing manufacturers of the advantages of electrification. Birmingham established a new record on one day in Christmas week by supplying over two million kWh, representing an increase of 8 per cent. upon the previous highest point.

Sales Conferences

THE Sales Conferences organised by the Electrical Development Association will be resumed on Thursday evening next at Newcastle-on-Tyne, when the Director, Mr. A. C. Cramb, will lead a discussion on " Development—the Industry and Your Part in It." On the same evening at Leeds, Mr. W. J. Jones will introduce the subject of " Lighting in Churches, Art Galleries, Hospitals, &c." The London conference for the month will take place on January 15th, when Mr. A. G. Clausen will tell " What Every Electrical Salesman and Saleswoman Should Know About Electrical Refrigeration," and that, given plain speaking, should afford matter for a really good debate.

Not Looking Backward

THE record for the year nineteen thirty-one is closed. We have neither time nor inclination to look backward, though future historians may count the year as one of the most momentous of the century. It was the custom in old-fashioned and less exciting electrical days to write a detailed account of the past year's events, but nobody needs it when there are so many new things demanding attention. One of the most attractive things about electricity is its constant kaleidoscopic change. We confess to being more interested in what will happen in 1932 than in what occurred during 1931. What are the prospects? Mr. Pybus, in wishing the industry success, says that the way is open for a great forward step in the electrification of Great Britain. If we are ready to take that step we may have before us a record electrical year. That it may be so is our New Year wish to every reader of the ELECTRICAL REVIEW. Electricity is still young. It has yet great things to accomplish. Though the whole world groans in travail it must electrify itself—there is no substitute for electricity. Let it co-operate to the full in reviving our industries and in bringing about world economic recovery.



Some Aerial Views of Electricity Supply Plants

1. The Barking station of the County of London E.S. Co. 2. The Lots Road ("Underground") power station. 3. The grid sub-station at Bedford. 4. Barton station (Manchester Corporation). 5. Derby Corporation's undertaking. 6. The Yoker station of the Clyde Valley E.P. Co. (*Photographs by Aerofilms, Ltd.*)

The Installation Problem. By W. R. Rawlings, A.M.I.E.E.

The President of the E.C.A. and allied associations points the way to complete domestic electrification

IN attempting to say something new, or at least provocative, concerning the installation problem (because it is so useless to say the same old orthodox things over and over again), I feel that the matter is so involved that it is difficult to decide either where to commence or where to leave off. Perhaps the simplest way is to summarise our needs and to suggest an ideal, leaving further discussion to show how near to that ideal we can approach in everyday practice.

The need, as we are told again and again, is to load the grid, and it is apparent that the load for the grid will be provided, in the main, from fairly densely populated domestic areas, to a secondary degree from industry, and to a minor degree from rural districts. The industrial situation is already under adequate control. In this division, the Home Office maintains a standard of work and supervision that leaves little to be desired, but in the domestic field, and in the minor rural field, everybody is free to do exactly as he likes, a procedure, to say the least of it, that is responsible for most regrettable confusion.

In the first place, then, we have need for a national and enforced code of wiring rules for domestic and rural installation and use. The whole thing must be simplified, standardised, and reduced to black and white direction. A thing that is reasonably good and appropriate in one place must be equally acceptable fifty miles away. Individual fads and fancies have been the curse of the electrical industry for far too long. Collective opinion and decision must rule the day.

Furthermore, we must get down to practice and not adhere, at least blindly, to theory. In this direction, however, I desire to make it perfectly clear that the following suggestions are made entirely on my own responsibility. They are in no sense "official" or representative of any "body" or institution. If electrical men hesitate to say what they think for fear of upsetting somebody else, or for fear of having their ideas knocked down or proved to be wrong, then we shall make very poor progress indeed. Let us have these matters discussed freely and frankly, and without dogmatic and immovable prejudice.

The Desirable Installation

So much having been said, I would suggest that the electrical arrangements considered desirable in public buildings, blocks of offices, country houses and large residences generally are not necessarily the best permissible arrangements for small private houses. In these circumstances, then, let us confine our attention to the ordinary villa-type of residence consisting, broadly, of dining-room, lounge and kitchen on the ground floor and, say, four bedrooms on the first floor. I select this type of residence because the bulk of the people most likely to make really comprehensive domestic use of electricity actually live in such houses.

Now the question is, by what means is this villa residence to be equipped so as to afford real electrical convenience on the most economical lines? Ignoring lighting requirements, each room must have a liberal number of power outlets—the dining-room, a main heating outlet and two smaller outlets for dining-table and sideboard use; the lounge, a main heating outlet and two smaller outlets for the tea-kettle and muffin-toaster; the kitchen, outlets for the cooker, washer, refrigerator and at a bench for minor heating equipment; and each bedroom with three smaller outlets each, one near the dressing table, one near the bed-head, and one in some central position.

This bedroom arrangement confined to three 5-A plugs is based on the fact that two directional bowl fires in a bedroom provide far more dressing *and sickness* comfort than one large heater more or less anchored to the fireplace position. In addition, we must have one large outlet in the hall for vigorous heating in really cold weather, plus two smaller outlets for vacuum cleaner connection, one in the hall and one on the first-floor landing.

"Rating" and Actual Use

This little list includes some twenty-five socket outlets, with a total "face" capacity of something like 170 A. The outlets are necessary for real *convenience*, but the fact remains that the total supply to the house in question in all ordinary circumstances might be limited *with complete satisfaction* to a maximum of no more than 50 or 60 A.

The small dining-room (say 15 ft. by 12 ft.) would have one 15- and two 5-A sockets, but a load of 25 A would hardly ever be forthcoming from the room, (*a*) because the 3 kW fire would be "full on" only on rare occasions, and (*b*) when the two 5-A sockets were in beneficial use (probably for fifteen or twenty minutes) the load on them would not be 10 A, but consist probably of a toaster and coffee percolater providing a total load of less than half that amount.

The same remarks apply to every other room in the house, generally speaking not more than two or three rooms being in full electrical use at one and the same time. It is these facts that bring theory into direct conflict with actual practice.

Because we have provided outlets capable of connecting 170 A, must we put circuits at the back of them capable of supporting such a total and never-to-be-demanded load? The convenience outlets *must* be there, but to imagine that every outlet in each room is to be called upon simultaneously to deliver its total apparent output is to view the domestic situation from an academic and not from a practical point of view.

However, even from an academic point of view, the situation outlined above can be controlled with perfect safety. I would suggest running *one* 15-A circuit to the dining-room already visualised and putting some simple type of, say, 20-A cut-out or limiter in the same circuit. Rarely, if ever, would the demand on that circuit approach, much less exceed, 15 A, and if, at times, a load of 18 or 19 A came on the circuit for brief periods of time nobody would be a halfpenny the worse off.

I would loop each pair of bedrooms in one similar circuit. If four bowl fires were "on" in such a pair of looped bedrooms at one and the same time (a rare occurrence) we should still have an absolute minimum of 600 W available between the two rooms for hair-dryers, shaving-water heaters, and other items. In such an arrangement we should have a total of 170 A in convenience outlets with six circuits behind them having a total capacity of 100 A (20 A for the kitchen) and a current limiter of 50 or 60 A might stand with complete satisfaction as an alert sentry over the whole outfit.

Abolish the Fuse!

One of our main troubles is to be found in the present system of renewable ginger-beer-bottle-wire fuses that are capable of such monstrous misuse. The system of safeguarding a circuit by bridging over a gap in that circuit by means of a flimsy piece of wire pinched between two binding screws is simply a survival of primitive barbarism. Some simple type of overload release or calibrated fuse-board that cannot be tampered with (strengthened up) is most obviously called for.

Such an arrangement would teach the consumer to use his individual *circuits* with care and understanding. Clearly enough, also, each outlet on the circuit must be fused *at* the outlet. This provides the only sensible means of checking the insertion of a piece of apparatus taking 3 A into a 15-A socket fused at the base of the circuit to 30 A or more.

An alternative method is to go back to the old "tree" system by putting a heavy ring circuit or circuits round the house and tapping off with suitable junction boxes and d.p. fuses as and when required. Here again, and within reason, any number of convenience outlets could be installed, in the sure and certain faith that only a small proportion of them would be in use at one and the same time. An overload release or current limiter at the commencement of things would protect the supply authority from unreasonable and unnecessary demands and would teach the consumer to use his installation with due care and understanding.

The Automatic Trip System

In rural surroundings and in certain domestic situations, I am moved, from a safety point of view, to direct particular attention to the automatic trip system of protection which is being so vigorously dealt with by my friend, Mr. T. C. Gilbert. I also agree with another friend, Mr. R. Grierson, when he pleads for d.p. switching, the marking of the phase side of the switch, and the marking of the phase socket in the outlet. Proper use of the latter, however, should be secured by making the plug non-reversible and by colouring the phase wire, even in flexible cords.

I am convinced that the wiring of the future must be based upon utilising the present earthed neutral of the a.c. system by making it solid to earth, an uninsulated connection at each consumer's premises. In other words, an uninsulated earthed neutral system. Up to date I have yet to learn any real objection to such a system, although it is employed in many towns throughout the country, and there are thousands of installations in use on the d.c. system. Critics, so far as I have met them, are in favour of the system where they have used it, and against it where they have not—a criticism which I think speaks for itself.

A Primitive System. By G. E. Williams, B.Sc., A.M.I.E.E.

How electricity was supplied to a Colombian town

IN these days of intense specialisation, it is seldom that an engineer has the opportunity of applying more than one of the branches of knowledge that he may have studied. In undeveloped countries and isolated communities, however, specialisation is practically unknown. A bacteriologist prescribed for astigmatism, a monk made blue-prints, and I, who had specialised in telephony at home, wished that I had learnt hydraulics and surveying when I found myself in Cali, Colombia, employed by the local light and power company, nominally as assistant to the distribution engineer, but actually as jack-of-all-trades.

Eight years ago, if one had walked down the principal thoroughfares of this city on a Saturday afternoon, one would have encountered no other sign of life than an occasional dog sleeping in the road. The place would have had the appearance of being completely dead, in which condition it had probably been for a hundred years or more. There were no amusements except the bull-fight, no drains but an open channel in the middle of the roughly cobbled road, and few buildings other than single-storied houses built in the form of a hollow square and made of adobe.

The Awakening

Now they are concreting the roads, have many concrete buildings, several cinemas, a municipal theatre, better sanitation, an up-to-date waterworks, two breweries, and other adjuncts of civilisation. For some reason or other the town has begun to develop. This development is reflected in the following figures, which give the week-day peak loads and installed capacity of the light and power company for 1912 and some of the subsequent years:—

Year.	1912.	1916.	1919.	1926.	1927.	1928.	1929.
Day peak kW (mostly power) ..	49	60	97	315	395	660	825
Night peak kW (mostly lighting) ..	103	148	156	655	1,083	1,308	1,480
Total plant kVA	300	300	600	1,100	1,600	1,600	2,600

The records were unearthed with much difficulty. Those for 1912-1919 were incomplete and literally moth-eaten, and those for 1920-1925 were totally lost.

Generation and Distribution

The original plant consisted of two 150-kVA, 2,400-V, two-phase, 60-cycle Westinghouse alternators, driven by Pelton wheels, which were supplemented in 1919 by a 300-kVA unit of similar type. The station is situated three miles from the town, and power was first transmitted at the generated voltage, but later it became necessary to step the pressure up to 6,600 V.

In 1926 another station was put into commission, five miles away, containing two 500-kVA, 2,400-V, three-phase units. The company was changing the transmission from the old plant and the distribution in the town from two- to three-phase when I arrived in 1927.

Festoons of wire (including telephone lines) outside a lawyer's office

Transformers, high- and low-pressure lines and telephone wires on one pole

all the better for not having had their insulation interfered with in an unorthodox manner.

All the main streets in the town, which were very narrow, had 2,300-V transmission lines running along them. The poles consisted of riveted tin-plate fitting over a short cast-iron pipe buried in concrete. When a motor car collided with a pole, the pipe sheared off on a level with the road, and the remainder of the pole was shifted laterally, held upright by the wires.

There were two separate circuits, one for flat-rate and street lighting, switched on at 6 p.m. and off at 6 a.m.—we were only 200 miles from the equator—and the other for power and metered light.

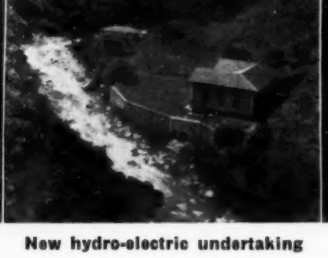
Transformers of all sizes from 1 to 25 kVA hung on the poles. From these, the secondaries at 110 V for light and 220 V for power were carried on porcelain insulators screwed to blocks of wood, which, in turn, were fixed to the adobe walls of the houses by 8 in. nails! This arrangement put a limit on the size of wire, and, consequently, on the capacity of the transformer, because stranded wire is seldom employed over there, and had they used anything larger than No. 4 B. & S., the block of wood would have come away from the wall when they tried to make the wire taut.

In this town of 70,000 inhabitants, we had 7,000 flat-rate lighting consumers—Colombian families are large. Our biggest industrial load was 250 kVA, a cotton mill where spinning and weaving were carried on in the same building; there were also half a dozen factories, or rather workshops, requiring 100 kVA, and five hundred small domestic power loads, mostly irons.

Surveying the Ground

My first business was to make up a map of the town, walk all round the streets noting the positions of transformers and secondary circuits, consume innumerable ice cream sodas, work out one or two centres of gravity, and then calculate the wire sizes for the new three-phase primaries.

Original water-power plant



New hydro-electric undertaking

Diesel station

The 6,600-V transformers were Scott-connected at the plant end of the transmission line, and we had to provide a *quasi*-Scott connection for all the consumers who had two-phase motors. The transformers had centre taps, but no "0.866" tap. As an experiment, the distribution engineer poked about in the primary of one transformer with a penknife and found the point which gave equal voltages in the secondaries, but in the remaining groups we used the whole of the primary winding; they worked quite well—probably

In a few months I had maps and card indexes showing the positions of transformers, primary and secondary lines, with sizes of wire used, and lists of consumers connected to each transformer, together with their loads. I also had to solve occasional hydraulic problems, albeit nothing more severe than applying Bazin's channel formula, to calculate the strains on different makes of pole with and without various groupings of transformers hanging thereon, and to work out our transmission losses when I had discovered just exactly what sizes

of wire and cable had been used for the various runs.

In Colombia there are two wet and two dry seasons in the year. In 1928, with the peak at 1,300 kW, and a capacity of 1,600 kVA, there was not much reserve, and the voltage was noticeably low in times of drought. At the height of each rainy season the aqueduct, which was cut in a hillside, would get blocked up or completely washed out in one or two places, and there would be no electric light in the town for a week.

The erection of a Diesel-electric station of 1,000 kW was contemplated by the proprietor as a stand-by, but was not actually erected until after the undertaking had been acquired by an American corporation late in 1928.

Straightening Things Out

The new company has now "revamped" the whole of the distribution system, clearing away all the "spiders' webs" depicted in the preceding page. The high-voltage lines are carried on arms projecting over the roadway, so that no one can touch them when leaning out of balconies; the l.v. lines have been removed from the walls of the houses and are carried on vertical racks mounted on the poles.

To conform with standard American practice, the system has been changed from delta to star, thus increasing the voltage between phases to 4,000. The vertical racks carry current for 110-V flat-rate lighting and street lighting with relays for switching on and off at sunset and sunrise, 110-V single-phase power and metered lighting, and 220-V three-phase power for loads of 5 h.p. and over.

The new company aimed at having large secondary circuits common to as many consumers as possible. To avoid providing Scott groups here and there we therefore changed as many two-phase motors as were convertible to three-phase, *i.e.*, those that were former-wound and had the right number of slots per phase per pole; this saved us the expense of free replacements. Among our efforts may be mentioned a 2,200-V, two-phase, 50 h.p. motor that we changed to 220-V, three-phase. From the point of view of insulation perhaps it was just as well that we did not have to carry out the opposite transformation.

Before the expiration of my contract I also surveyed both plants and the sub-station in town, turned out a set of plans and wiring diagrams, and did similar work in the neighbouring town of Buga, where conditions were as primitive as they had been in Cali until quite recently. There has apparently been little change in many South American towns since Dana wrote *Two Years Before the Mast*.

Judged by our standards the power handled may not have been great, but to a young man perhaps the advantages of a bird's-eye view more than balanced the smallness of the undertaking.

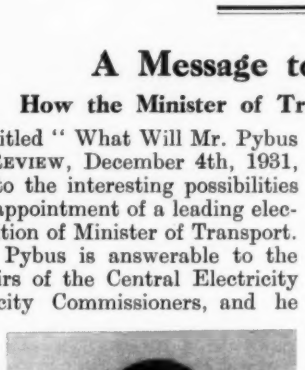
A Message to the Industry

How the Minister of Transport views the situation

IN a leading article, entitled "What Will Mr. Pybus Do?" (ELECTRICAL REVIEW, December 4th, 1931, p. 833), we referred to the interesting possibilities that existed through the appointment of a leading electrical engineer to the position of Minister of Transport.

In that capacity Mr. Pybus is answerable to the Government for the affairs of the Central Electricity Board and the Electricity Commissioners, and he comes to his exalted post at a time when big steps forward in electrical development are necessary.

We are now authorised to publish the following communication from the new Minister as his New Year's Message to the Electrical Industry. It will be observed that Mr. Pybus shows that the way has been opened for a great forward step in the electrification of Great Britain and that electricity supply should be made available to a larger range of householders. Standardisation of industrial and domestic appliances is necessary and urgent. Manufacturers are urged to take "full and proper" advantage of the import duties that Parliament has imposed on certain electrical appliances, but a "sound article at a reasonable price" is necessary.



[*Vandyk*

Mr. P. J. Pybus, C.B.E., M.I.E.E., the Minister of Transport

Mr. Pybus's Message

Once more the consumption of electricity in the towns and densely populated areas shows a gratifying increase, but much more progress remains to be made.

Under the auspices of the Central Electricity Board standardisation of frequency and the great scheme of the co-ordination of the generation of electricity have opened the way to a great forward step in the electrification of Great Britain.

The real harvest, however, will be reaped when, in due course, electricity is more generally available to a larger range of householders. This further development, together with continued progress in the standardisation of industrial and domestic appliances, is obviously a most urgent and necessary step.

Parliament has authorised the imposition of import duties on certain electrical appliances, and I am sure that manufacturers of this country will take full but proper advantage of these provisions. In their own interests and in that of the country at large, they will no doubt appreciate the necessity of offering the consumer a sound article at a reasonable price.

I wish the industry every possible success in the coming year.

P. J. PYBUS.
Minister of Transport.

A Lighthouse Service Steamer

THE new Commonwealth Lighthouse Service steamer, *Cape Otway*, made her maiden voyage on October 3rd, 1931, and proceeded to Fremantle, her home port. She is a single screw steamer of 996 tons.

Two 12-ton derricks at the foremast handle mooring buoys and other heavy lifts, and two 3-ton derricks load lighter materials. Refrigerated rooms are provided because large quantities of perishable goods are carried for lighthouse families. The generating plant consists of two steam-driven 16.5-kW generating sets in the engine room, and a 12-kW emergency set on the boat deck. The emergency set can be connected to the main switchboard in the engine room, and will supply power for lighting and for the galley blower and refrigerating plant. The main switchboard consists of two generator panels each fitted with a 3-pole circuit breaker and double pole switches and fuses for each outgoing feeder. The instruments and switchgear are fitted on $\frac{3}{4}$-in. "Sindanyo" panels with bevelled edges mounted on a light steel framework. The emergency switchboard and the main distributing switchboard, which controls all the lighting and heating points, are of similar design.

The general lighting and power installation consists of 207 lighting points, 36 heater points, 36 fan points, 6 cargo clusters, 8 tubular heaters in the saloon, 8 navigation lights and 4 lifeboat lights. A low-power switchboard together with two 120-Ah 12-V batteries supply power to the signal and bell systems, the Walker electric log, and secondary lighting.

The wireless room is equipped with the latest type A.W.A. 1½-kW valve transmitting panel, suitable for short and long wave transmission, with motor-generator sets, but the most interesting apparatus on the *Cape Otway* is the Admiralty-type echo-sounding gear. This apparatus sends out signals in the form of a series of taps on the bottom of the hull at a constant rate per second, the echo from the ocean bottom being received on special apparatus which shows the actual depth in fathoms. The recording gear then plots a depth line in conjunction with a datum line, producing a complete graph showing the contour of the bottom of the ocean.

The whole of the 9,000 yards of cables were supplied by W. T. Henley's Telegraph Works Co., Ltd. They consist of "Vicma" 600-megohm grade insulated cables, lead-alloy covered, cotton braided over all, and coated with white dryers. The sizes range from 3/0.029 to 37/0.093 in single, twin, and armoured cables.

Rationalising Electrical Publicity. By Protonius

IN his article on "The National Canvass—and Beyond" (ELECTRICAL REVIEW, December 4, 1931), Mr. W. E. Swale says that "the idea that electricity is difficult to sell, because the conditions of supply are capable of almost infinite permutations, is all moonshine. Our great rivals dispense a commodity which as regards legal, financing, generating and servicing conditions must be very nearly as complex as our own, but have these difficulties deterred them from building up a superlative sales organisation?"

Mr. Swale's argument is directed towards the electricity supply industry, and to it alone. So is the proposal for a National Canvass. Within these limits the problem of salesmanship is so extensive and so urgently in need of energetic attack that any suggestion of broadening the issue to cover the whole electrical industry might perhaps be regarded as hopeless from the start. It would multiply the permutations which, in the supply industry itself, already discourage the feeble-hearted, and it would unite those who are still struggling with the difficulties of sectional organisation to contemplate something much more ambitious.

Nevertheless, in these days of anxious introspection and equally anxious desire for progress, a good purpose may be served by raising the question whether the general principles upon which we have been proceeding in our organisation of electrical publicity are sound.

Special and General Propaganda

Co-operative electrical publicity, as at present arranged, aims at increasing the consumption of electricity from the public mains. The interests of various branches of manufacture and of numerous applications of electricity are concerned, along with those of the supply undertakings, in this development. There are, however, many electrical interests that stand outside. Moreover, among those directly represented, some are liable to be more actively treated than others, on account of their superior demand on the supply stations. Thus the Electrical Development Association has always been an association for the development of certain electrical applications, not for the propagation of the electrical idea as such.

Two effects have resulted. One is that the dominant policy of the Association has fluctuafed among various fields—lighting, cooking and heating, domestic labour-saving, industrial, electro-medical and so on—according to the measure of pressure or support from different sections of the industry. The other is that departments of electrical enterprise with little or nothing to add to the load on central stations have had to build up their own organisations for public propaganda.

A conspicuous example of this effect is afforded by the Telephone Development Association. When the telephone system was taken over by the State, the official decision that the Post Office could not undertake propaganda led to the formation of a manufacturers' group to perform a necessary task beneath the dignity of St. Martin's-le-Grand. This group has its separate publicity organisation, with its own staff and its own contacts with the Press.

Similarly, when broadcasting was introduced, the manufacturers and traders concerned had to create their own means of educating the public. In certain directions, also, the British Electrical and Allied Manufacturers' Association has taken part in public propaganda; and even the Central Electricity Board has had to do its bit in counteracting the disease of pylonitis which has retarded the growth of the grid. There are other bodies which from time to time engage upon general publicity in favour of one phase or another of the electrical idea.

Too Many Organisations

This arrangement is bound to lead to the duplication of machinery and overlapping of effort. It gives us a number of organisations working within limited range with inadequate resources. Ever since its inception the Electrical Development Association has been hampered by lack of funds, and it may also be asserted that none of the other bodies has had enough money to conduct its operations on the scale required to make a decided impression upon public opinion.

From the point of view of the Press—which is the main channel of publicity—the dissipation of effort is unfortunate. An editor or publicist who requires information on any subject concerning gas knows where to get it, but if he is after an electrical "story" he has to be unusually well acquainted with the industry to discover the best source of material.

However we may choose to moralise on the subject, the fact remains that the attitude of the Press towards an industry depends to a material degree upon the attitude of the industry towards the Press as a commercial medium of publicity. The association of electrical propaganda of all sorts with a single organisation would therefore create a better atmosphere than is possible under the present conditions, in which we have a number of independent bodies each trying to "put over" a feature of the electrical story.

One Increasing Purpose

Early in the days of electrical publicity an American company evolved the slogan, "All together all the time for everything electrical." We have failed to get beyond the point of "Somebody part of the time for something electrical." The realisation of the full co-operative idea seems to depend upon building up a central organisation that will foster and protect every application of electricity. Admittedly it can do so, by direct action, only on broad general lines, but it is precisely on these lines that our greatest need for propaganda lies. We want most of all to spread and confirm the habit of seeking an electrical solution in all directions. We want to preach the electrical gospel as such; and no sectional association can adequately perform this function.

From time to time, of course, it becomes necessary for sectional bodies to organise special campaigns, but this can be done quite effectively, by the interests specially concerned, under the auspices of the central association. At one period the Electric Lamp Manufacturers' Association ran its own campaign for better home lighting; its policy now is to conduct such intensive schemes through the Electrical Development Association, with benefit to all concerned. Properly equipped, a national electrical propaganda body should prove of material assistance to any section of the industry in its specific enterprises.

Briefly, the proposal amounts to the rationalisation of electrical publicity on the lines adopted in the supply, manufacturing and other branches.

"English Electric" Activities in 1931

MANY important switchgear contracts have occupied the attention of the English Electric Co., Ltd., during the past year, particularly in connection with the grid. Good progress was made with an order for thirteen 130-kV substations for the South-Eastern Electricity Scheme, and many of the stations, including those at Swanscombe (ELECTRICAL REVIEW, October 2nd, 1931, p. 498) and Tunbridge Wells (December 18th, 1931, p. 915), have now been put into operation.

A number of improvements have been effected with regard to e.h.p. outdoor sub-stations and metal-clad compound-filled gear for pressures up to 33,000 V. A typical order for the latter class of apparatus was one valued at nearly £70,000 for the Smethwick and Oldbury transforming station, similar apparatus having also been put in hand for the Cornwall Electric Power Co., the Bermuda Electric Light, Power & Traction Co., the London and Home Counties Joint Electricity Authority, and the Woolwich, Preston and Ealing Corporations. A complete 66-kV station for erection for the S.W. & S. Electric Supply Co. at Banbury is an example of recent orders for large outdoor sub-stations.

Orders for generating plant have on the whole been for a considerable number of units of relatively small size rather than for the large units associated with modern power stations. A 30,000-kW two-cylinder turbine for the Yorkshire Electric Power Co. and a 25,000-kW three-cylinder set for Sheffield Corporation were among the plant under construction, while "Fullagar" engine units included a 1,500-h.p. set for Karachi and a 2,500-h.p. engine for Bermuda, the latter, it is claimed, being the largest land type "Fullagar" yet completed. Other interesting contracts included a 15,000-kW set for Poland and a 10,000-kW set for the Hayle power station of the Cornwall Electric Power Co. Successful tests were carried out on the application of airless fuel injection to the "Fullagar" engine. This improvement simplifies the running gear and reduces the overall length of the engine.

The transformer department was very active during the year in handling a large volume of orders and in development work. Several 45,000-kVA units for the grid system were completed, while attention was turned to the production of a standard range of distribution transformers eliminating as far as possible the necessity for maintenance work.

Heavy equipment for rolling mills, electric winding plant, &c., was in demand both for medium and large installations, and the activities of the industrial drive department were well maintained, both in respect of the output of motors and control gear and of the improvement of existing designs and the development of new ones.

During the year the company completed the electrification of the Madras suburban lines. Various types of vehicles and equipments have been ordered for tramway undertakings, fifty tramcar bodies having been supplied to the Leyton Corporation and six double-deck tramcars of the luxury type to the Huddersfield Corporation. With regard to trolley-'buses, the company completed a large number of equipments for the London United Tramways and has supplied trolley-'bus bodies and equipments for Walsall and Kyoto, Japan.

Technical Reports. By. J. W. Meares, C.I.E., M.Inst.C.E., M.I.E.E.

Rules to be observed in their preparation that would make for clarity in interpretation

MOST engineers in responsible positions are called upon from time to time to write reports upon projects, works in progress, or completed works; but, apart from the lamentably slipshod English and punctuation generally employed, how few seem able to marshal their ideas into a logical sequence. To the writer of the report, no doubt, it is all quite clear; but he often overlooks the fact that other persons, not necessarily engineers, having no first-hand knowledge of the subject, have to wrestle with his ambiguities and lack of arrangement and to guess what was in his mind when he penned a particular sentence.

[*Lafayette.*]

Mr. J. W. Meares, C.I.E., was formerly Electrical Adviser to the Government of India and Chief Engineer of the Hydro-Electric Survey of India

Easy reference is a prime essential of a report. To this end, all paragraphs should be reasonably short, duly titled with a sub-heading, and consecutively numbered; and, if necessary for lucidity, further split up into, say, 3 (i), 3 (ii), 3 (iii), &c. This treatment enables subsequent readers and commentators to find a particular passage without delay, and to refer others to it.

Page references are a nuisance, for not infrequently copies of the report have been typed on both quarto and foolscap paper, with the result that p. 5 in one copy is p. 7 in the other. I have seen one such recently, and in the particular paragraph involved there was matter enough for half a dozen or so sub-headings.

Proper Arrangement

Most things, except a vicious circle, have a beginning, a middle and an end; and in broad outline these are represented by Part I, the preliminary matter; Part II, the report proper; and Part III, the summary of conclusions and recommendations. All these must vary greatly according to the subject matter, but not infrequently they are all mixed up in inextricable confusion. Generally, however, they constitute three broad divisions, of which the middle one may need breaking up into a considerable number of sections, each of many paragraphs.

In Part I, starting off with a title, there should be a full list of contents, giving both the paragraph numbers (on the left side)) and the correct pagination for the copy in question. This should be followed by all the essential introductory matter, in as many paragraphs as may be necessary to a clear exposition. Generally the scope of the report should come first, with particulars as to the reasons for making it and the persons for whom it is made, followed by such information as it may be desirable to record concerning the dates when the site was visited, the journeys made in the course of the investigation, earlier reports by other investigators, and so forth. Information gleaned from various sources can here be referred to, if it has a bearing on the problem, but only in general terms.

The Main Body

In Part II, the report proper, there are so many different subjects that may have to be dealt with at one time or another that it is obviously impracticable to lay down any hard and fast lines; but some general principles, more honoured in the breach than in the observance, may safely be enunciated.

Reports on works already done, or on works in progress, are the simplest to deal with. Criticism should be definite and constructive, so that immediate action can be taken on it. Projects are much more varied and complicated. There should always be a clear demarcation between the economic and engineering aspects, which should then be co-ordinated at a later stage.

Assuming that the report deals with a power generation and distribution proposal, demand should generally be dealt with before supply. The economic aspects of the existing and prospective load, how it is now dealt with (if at all), and what costs it will bear, should usually come first; it is seldom necessary (though only too common) to mix these up with the new proposals to be made.

Thereafter the reporter's own scheme (or alternatives) for supply and distribution must be fully dealt with, first from the engineering standpoint, and later from that of estimates.

Tabular Statements

At the beginning either of the economic or the engineering section, or in some cases partly in one and partly in the other, there should be a concise statement in tabular form of the data of the problem coupled with a statement of the knowledge, information, examination, or (occasionally) hearsay on which these data are based, with an appreciation of their degree of reliability. There are few things more annoying than to be compelled to turn over page after page in order to collect together scattered figures which could easily have been brought together. When some of the data involve a lot of explanation and calculation, it may be desirable to relegate the latter to an appendix, lest one fails to see the wood for the trees. Any special formulæ or short-cut methods of working adopted in the report may conveniently be put with the data.

In the generality of projects there will be several possible engineering solutions before the reporter, all of which he will have to examine in detail in his preparatory work. Sometimes one of these will prove obviously the best, in which case the others may be briefly mentioned—to show that they have not been overlooked—and dismissed in early paragraphs. Should there be two or more proposals between which the choice either is not clear-cut or lies in the business rather than the engineering sphere, the alternatives should be kept in distinct sections and subsequently summed up and compared in separate paragraphs.

Sketches and Diagrams

Whether detailed drawings and plans are required depends on the subject matter of the report. In a reconnaissance they may be out of place, but sketches or diagrams can almost always be used with advantage. To take one example: a preliminary water-power scheme, however nebulous it may be at the moment, should always be accompanied by a sketch showing the relative levels of the tail-race, power house, pipe head or forebay, weirs and their draw-off level, flood levels, and so forth; together with a sketch plan of the stream with all these marked.

Having thus considered the whole field from the two sides of demand and supply, the two should be co-ordinated to show the soundness or otherwise of the proposals from the point of view both of profits and of the raising of capital. In this survey there should be a tabular summary of the estimates for the work and its maintenance and capital charges, the full details being preferably placed in an appendix.

Before even drafting Part III, the whole of Part II should be carefully checked to see that there are no miscalculations or anomalies. If there is any likelihood of another opinion being sought on the proposals and figures, it is desirable to state the manner in which they were obtained, in sufficient detail to be of use, or even to give a summary of the calculations in an appendix. Often there are several empirical rules which give widely divergent results, and it is necessary to know which has been used. Constants and efficiencies are also a frequent source of ambiguity. In electrical projects it is preferable to employ the kilowatt (which is international) rather than the horse-power, which is apt to be vague.

Final Summary and Appendices

Part III, the summary and recommendations, should be as brief as is consistent with perfect clearness. It should not assume that the detailed report in Part II can be taken as read, but should give chapter and verse references to the paragraphs under survey. Only a reviewer can sum up a lengthy document by reading the first and last pages and the advertisement. Matters should be made as easy as possible for the persons who have to grapple with the issue. Where it is recommended that development should be carried out in stages, as will usually happen, each stage should be briefly summarised in a separate paragraph. If further investigation is recommended, its scope should be clearly defined.

Appendices are useful, but require careful handling. Nothing of primary and original importance should be tucked away in an appendix, but such matters as calculations, extracts from documents by other investigators, bibliographies, and drafts of legal documents such as agreements or licences, which are referred to in the report itself, may conveniently be placed here for ready reference. An index is usually only necessary in long and involved reports, as the list of contents should be sufficient; but if it is needed it should be comprehensive.

Electrical Mouldings

Synthetic-resin productions in a London factory

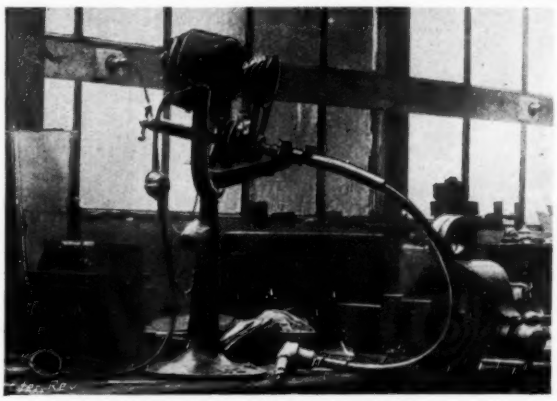
AN impression resulting from a recent visit to the works at Walthamstow of Thomas De La Rue & Co., Ltd., is that the electrical industry generally is, at any rate for competitive work, becoming increasingly dependent on the production of synthetic-resin mouldings. One saw insulators of all descriptions, telephone equipment, radio accessories, distribution and house-service fuse boxes, wiring-system components and electric traction apparatus, to name only a few articles, all produced as compound mouldings.

The production of mouldings involves very heavy initial expenditure in the manufacture of the necessarily accurate and highly finished tools, and because of this and the fact that mouldings can be produced so speedily it is essentially a mass-production business. To illustrate this point, we saw under production complicated mouldings to be sold at 4d. each; the moulding tool cost £360 to make. The factory processes are carried out continuously, day and night.

For the factory in question all raw materials are bought under chemical specification and checked in a well-equipped laboratory. In association with the research department there is a complete factory in miniature, with one of every kind of machine used in the factory proper. These small machines are used in the study of current production problems and in investigating the suitability of new raw materials, which have to be selected according to the functions required in the finished product—electricity-, arc-, heat-, and acid-resisting, and so on.

In large mixing machines in the actual works quantities of as much as 30 cwt. of powders at a time are given special attention to ensure perfect uniformity. Consideration of all inquiries received is based on the actual design and the tool which would be used, and from this careful and accurate estimating can be made.

When an inquiry develops into an order the design drawing



Portable tool-finishing machine

is detailed to the last screw and dimensioned to 1/1,000 inch before it is handed to the tool-production department. This shop is equipped with the most modern tool-room machines, and the work on the moulds is carefully planned throughout all the machining operations until it is finally hardened and assembled ready for setting up on the presses.

About fifty skilled craftsmen are engaged in this shop, each an expert in a particular speciality. All the tools are cut from solid steel. They are the customers' property, but the company acts as custodian for them and provides proper storage and registration.

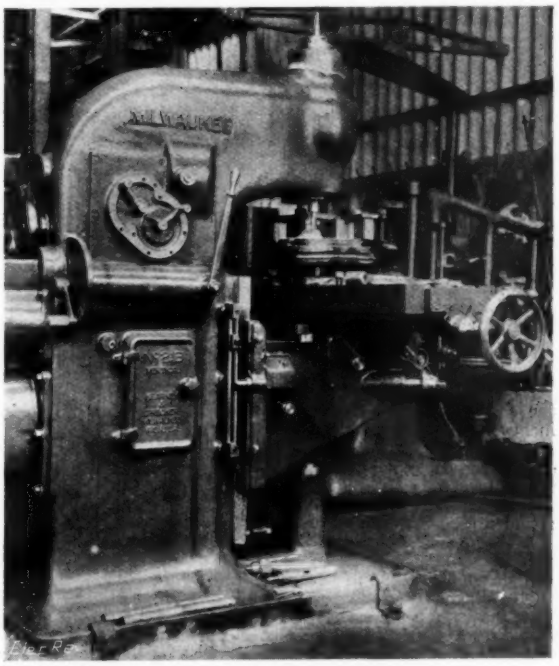
In the main press shop upwards of 100 hydraulic presses, of from 10 to 600 tons total capacity, may be seen. The double-pressure system is employed—stroking at 1,100 and moulding at 6,600 lb. per sq. in.

In normal production the powder in the mould first becomes plastic in character under the influence of heat, and then under the final pressure a homogeneous solid.

A new development witnessed is that of injection moulding in which, by electrical preheating, the raw material is converted to a plastic form which is practically instantaneously injected into cold moulds under a 60-atmosphere air pressure. The impressive feature of this process is the high speed at which complicated articles can be reproduced.

The material used, cellulose acetate, has extremely elastic properties and is thus particularly suitable for all forms of magnet and coil bobbins. Further, it has a high insulation value.

All the pressings are checked with the drawings and gauges



Vertical tool-milling machine

preparatory to being despatched for electrical inspection and finishing.

Electrical Testing

Of particular interest in the electrical testing department are the arrangements for dealing with telegraph-line insulators. There are forty or so metal tanks or trays in which are placed the insulators, inverted and partly submerged in water. A quantity of water is also placed in the thread cup of each article so as to form a contact with the internal screw thread. After 24 hours' submersion the insulation is checked by applying 400 V d.c. to each insulator.

The tanks are connected to the negative side of a constant-voltage battery, and positive connection is made to the water in each thread cup by a test fork in electrical communication with the battery *via* contact wires over the tanks and a special reflecting galvanometer in a separate test room in which precautions are taken to maintain constant temperature.

A point which should be stressed is that the galvanometer actually measures the current leakage through the insulators. The official G.P.O. test requirement of 10,000 megohms after 24 hours' submersion is the standard worked to for every insulator produced in the factory, but on routine production test readings of the order of 50,000 megohms are obtained.

To discover possible weaknesses and cracks in such articles as automobile battery boxes, similar submersion tests are made, but at 20,000 V from specially protected transformer equipment.

Some of the Products

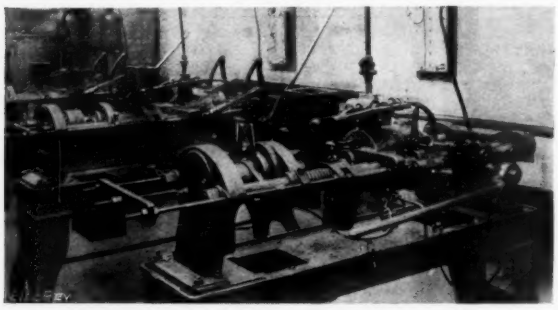
It would be out of the question to attempt anything like an inventory of the mouldings that are produced for the electrical

Moulds and their products: Left, telephone toll-call terminal box (top tool); centre, split-coil bobbins for wireless formers (four-impression tool); right, 14-pin jack assembly for automatic-telephone systems

and allied industries—their name is legion; but as it is felt that the average reader has little idea of the extensive part that mouldings play within the industry a few of the items which particularly arrested our attention may be briefly referred to.

The production of "Telenduron" insulators, of course, is an important part of the company's activities. It may not be generally realised that there are fifty-two different types of these insulators. Perhaps their most interesting feature, at least to the user, is that they are practically indestructible, so tough is the material, and they are not susceptible to undesirable results from ordinary temperature variations.

Pole cable terminal blocks with numerous terminal bolts, contacts, &c., all firmly embedded in the moulding material, form another useful line for the communications engineer, as do also completely moulded telephone instruments. Wireless cabinets are a recent introduction and they can, except for



Injection moulding machines; compressed-air injection, electrical heating

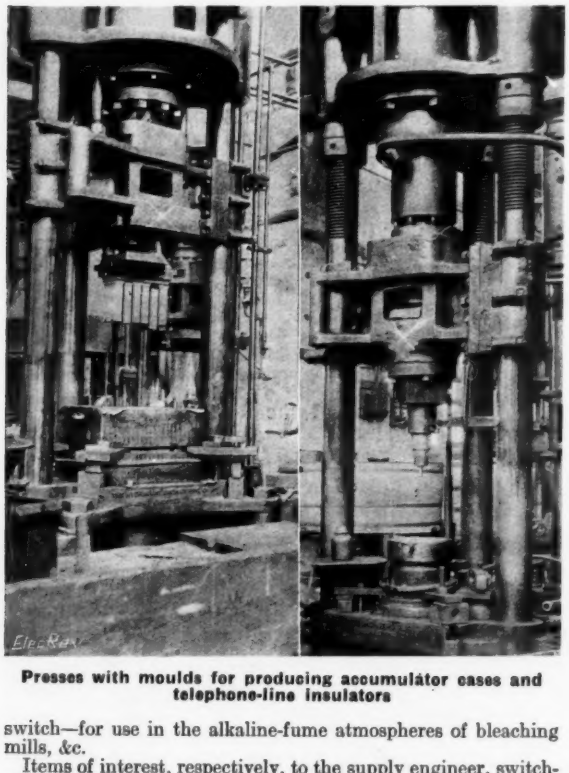
the cover, be produced in one piece in dimensions up to 15 inches long, 15 inches wide, and 10 inches deep.

Flaked fabric covers for electric railway feeder pillars were seen. The compound is reinforced with disintegrated linen fabric, resulting in colossal strength. Broadcast microphone bases are produced solid and vibrationless, with filter holes round the edges.

A sensitive telegraph relay, with the laminations, &c., completely moulded in, is an example of the production of a complete instrument in moulded form. All-insulated cases for high-voltage meters suggest the high insulating values that can be obtained, and so do shoe fuse blocks for traction work, which have to carry all manner of dirt and filth.

Again, insulator chains for aerial work by the Air Ministry may be seen; incidentally they start the viewer guessing as to how they are produced. Two completed links are accommodated in the tool in which the third and interconnecting link is moulded.

A H.O. pattern hand lamp is produced in one head with four separate screw threads. There is a complete range of wiring accessories—distribution box, ceiling rose, junction box and



Presses with moulds for producing accumulator cases and telephone-line insulators

switch—for use in the alkaline-fume atmospheres of bleaching mills, &c.

Items of interest, respectively, to the supply engineer, switchgear manufacturer and contractor are: a house-service fuse box, complete with a sealing chamber, as supplied to the Macintosh Cable Co., Ltd.; flash barriers of special arc-proof material; and series and parallel tee boxes for surface wiring systems. A very intricate moulding is a twin concentric coupling plug for electric traction work, with perfect insulation between the contacts.

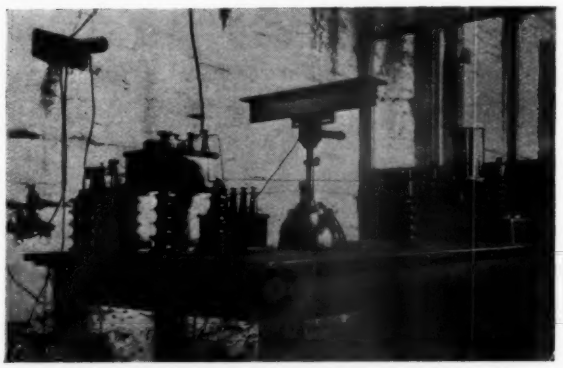
Of outstanding technical interest in the whole of the productions is the stationary commutator, for operating with radially rotating brushes, produced for the English Electric Co., Ltd., for the Calverley-Highfield "Transvertor." It has 420 copper bars moulded in with an insulation gap of 0.08 in., and the insulation had to withstand a test voltage of 1,500 r.m.s. for 15 min.—an exacting trial indeed. Each moulding took twenty-four hours to cure, and a pressure of 600 tons was used to effect the moulding. The commutator is believed to represent one of the largest mouldings ever produced; it has a diameter of three feet nine inches.

Every article produced in the factory is ordered before it is made. This, of course, is ideal from one point of view to the manufacturer, but it has led to very highly competitive work and, in turn, to a very exacting system of costing. By the continual feeding of information from the works to the costing department the cost of production of any article is known almost immediately.

Finishes and Colours

An outstanding feature of the mouldings is the excellent finishes that are obtained. Most of the articles leave the moulds with a very bright surface, and, except for the necessary removal of the thin projections, &c., formed at the edges of the tools, finishing in the general sense is usually not required.

But attractive dull, matt and other finishes are produced in



Reflecting-galvanometer equipment in test room

many forms, and it was curious to learn of the mould surface being damaged in order to produce a certain peculiar "sand-blasted" finish. Colours innumerable, too, lend to the fascinating aspect when viewing the works production schemes as a whole.

Many of the mouldings carry words, trade marks, &c., produced in the actual moulding operation, the tool being engraved accordingly. The company does its own engraving. In the polishing room we saw letter impresses on some moulds being coloured in very effectively.

Power-factor Correction

Undertakings changing from a lower to a higher frequency would do well to consider whether the inducements offered to consumers for power factor improvement are sufficient. Motors at the higher frequency have a worse power factor, but condensers become cheaper as the frequency increases.

Messrs. Geo. Ellison, Ltd., inform us that they considered the question in connection with their own works, as the current in their distribution cables had increased by about 20 per cent. after changing from 25 to 50 cycles. In Birmingham low power factor incurs no penalty, but the conditions of supply are that the power factor should not be less than 75 per cent. lagging. A reduction is offered of 3 per cent. for 85 per cent. p.f., or 5 per cent. for 90 per cent. p.f. Ellison's view was that a synchronous motor would be better than a condenser in the sub-station, because this method would enable the correction to be varied with the load. Correction at the individual motors was regarded as the best system, but too expensive.

With an installation of about 450 b.h.p., making a demand of 200 kW, the annual cost of electricity at 1d. per kWh would be about £1,000, less £50 for correction to 95 per cent. p.f. A 400-V condenser at 12s. per b.h.p. would cost roughly £270, the standing charges on which, at 5 per cent. interest, 10 per cent. depreciation, and 2½ per cent. maintenance, would be approximately £44. If the £270 were employed as working capital in his business, the consumer might be able to turn it over more than three times per annum with a 15 per cent. profit, thus earning a revenue of about £76 instead of the £50 allowed by the undertaking as a rebate.

Special Cooking Utensils

Are they necessary? Views of prominent supply engineers

THE advisability or otherwise of supply engineers advocating the use of special flat-bottom utensils with electric cookers, and also of supplying such utensils by direct sale, on hire or hire-purchase as part of the main equipment, or separately, has become a live question, and one that should be thrashed out to a solution, for too wide a diversity of opinion among supply men is bad for the industry. Further, the utensil question is bound up in some ways with that of the boiling plate, which is obviously still seriously concerning many supply people.

To try to arrive at some definite conclusions on the matter we invited the co-operation of a few prominent engineers and managers, and the following notes are based on some of the comments of engineers connected with fifteen undertakings. It is not suggested that the opinions of so few necessarily represent the general feeling throughout the industry, but it is hoped and expected that they will form the basis of constructive discussion which will clarify the position and so benefit the supplier, manufacturer and consumer.

An Essential Part of the Cooker?

It is a little surprising to find practically unanimous advocacy among the few undertakings in question of special utensils, but there is a wide difference of opinion as to whether the vessels should be supplied as an essential part of the cooker. Some engineers are quite convinced that they should be included in the hire charge, while others put the hiring forward as the stumbling block.

Mr. E. E. Hoadley, of Maidstone, considers it " extremely advisable and almost necessary that a kettle and one saucepan of this type should be supplied with each cooker." So convinced is Mr. L. Romero, Salford, of the need for these special pans if electric cooking is to be a thorough success, that " we hire a set of three pans to cooker users at 1s. per quarter for the set." That they should not be included in the hire charge, but supplied separately, as requirements vary, is the opinion of Mr. A. E. McKenzie, Wimbledon.

Mr. Fred. L. Ogden, of Oldham, goes so far as to suggest that the only way of overcoming the hot-plate trouble is to give attention to the utensils. " The one and only complaint against the electric cooker with consumers is that the boiling plate is not so efficient or convenient as a gas ring, and however distasteful this may be to the electrical industry it has to be admitted and the position met."

From Birmingham comes the opinion that the utensils should not be included as part of the cooker; Mr. E. J. Jennings, secretary and commercial manager, says: " In the case of cooker hire schemes this would throw the onus of their maintenance on the supply undertaking and increase costs."

Economic Considerations

On the score of economy there is general agreement, but most of the engineers consider that the time lost in cooking with ordinary utensils is the more important drawback. Mr. F. H. Rudd, Rochdale, says there is no doubt that 90 per cent. of the dissatisfaction with solid hot-plates is due to the use of pans which are unsuitable on account of their having been distorted by gas rings and fires.

To illustrate the effect of obtaining close contact between the utensil and the hot-plate, Mr. E. A. Mills, Halifax, directed some experiments in which " it was found that if the hot-plate were smeared with a fairly damp cloth, so as to exclude the air from the many very small holes in the plate, and the kettle placed in position before heat was applied, there was an improvement of something of the order of half a minute in the time of boiling." He says that with " open " boiling plates thin-bottom utensils are certainly more economical.

Mr. J. Harwood Lumsden, chief engineer to the Stalybridge, Hyde, Mossley and Dukinfield Tramways and Electricity Board, says: " In a recent test using an old ordinary aluminium pan a tumbler of milk took 22½ min. to boil, and this time was reduced to 4½ min. when a thick-bottom saucepan was used."

Mr. A. C. Green, sales engineer, Norwich, suggests that difficulty in maintaining complete contact between the plate and utensil is often due to the plate itself not retaining its true surface, and that while this is uneconomical, it is not so much so now that the higher-loaded plates are proving satisfactory. Both Mr. H. C. Lamb, Manchester, and Mr. H. Faraday Proctor, Bristol, are certain that the use of ordinary utensils cannot be proved to be generally uneconomical, Mr. Faraday Proctor adding the proviso, " if the ordinary utensils are reasonably flat-bottomed and of clean metal."

The Newcastle-upon-Tyne Electric Supply Co., Ltd., evidently attaches more importance to the hot-plate than to the utensils, as the following remarks come from Mr. W. F. T. Pinkney, engineer of the Lighting and Heating Department: " Flat-bottomed utensils are a distinct advantage for solid hot-plates so long as the hot-plates themselves do not buckle; there is, however, a distinct tendency to this. We ourselves regard the solid plate as a passing phase, and we are looking for some definite departure from, and improvement upon, it at an early date. . . . We have found in some cases that the mere fact of the flat-bottomed utensils being of heavy construction tempts the consumer to use them on a coal fire on occasions, thus defeating the object of special utensils for electric cooking."

On the question of dissatisfaction among consumers, Mr. C. F. Wells, sales engineer, Electrical Distribution of Yorkshire, Ltd., says: " Complaints of the slowness of hot-plates is very largely due to the type of utensil in use; and from Major H. Bell, Glasgow, we get: " Complaints from consumers of unsatisfactory service from the cooker are in many cases traced to the use of unsuitable utensils." Mr. Edwin Seddon, Edinburgh, writes: " Dissatisfaction has been caused in many cases due to the consumer not having thoroughly understood the reason for ground flat-bottom utensils."

Effect on Boiling-plate Maintenance

The majority of replies to our question—Does the adoption of special utensils lead to a reduction in the maintenance costs of hot-plates?—are to the effect that there is no definite evidence available of influence on the maintenance.

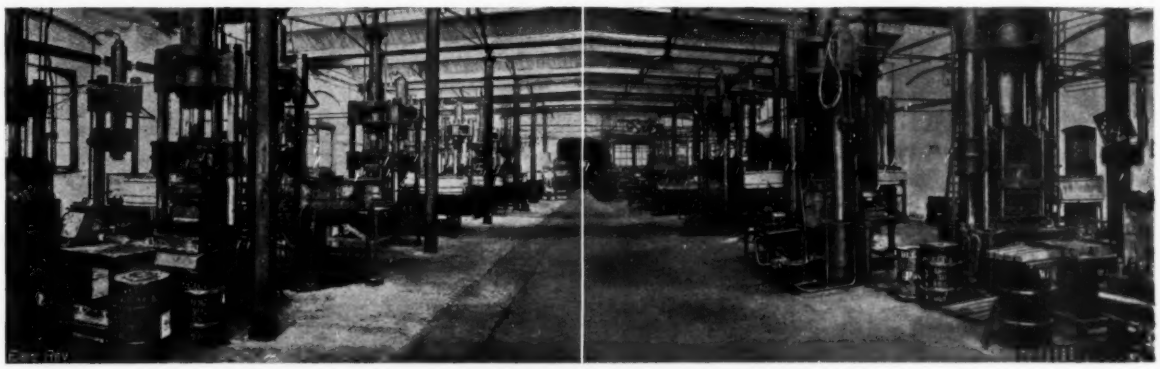
Bristol's reply is a definite " No," while from Yorkshire we learn that the type of utensil does not affect the maintenance of the plates, because they are all of the enclosed type. Some engineers, however, are quite certain that there is an adverse effect. For instance, Manchester says that hot-plate failures can occasionally be attributed to the use of damaged utensils, and Birmingham that special utensils have the effect of improving the efficiency of the hot-plate and increasing its life.

From Oldham we learn that if air gaps exist between the plate and utensil considerable scaling of the plate takes place in time, with the result that the plate becomes far from efficient, even if special utensils are subsequently used; this trouble is particularly noticeable where round pans are used on square plates. Maidstone has found " without a shadow of doubt that the use of flat-bottomed utensils has increased the life of enclosed hot-plates."

Attitude of Housewives and Cooks

The remaining point on which we endeavoured to get some impressions was the attitude of housewives and cooks towards the idea that they should scrap their old utensils. Generally the suggestion, where it is made, seems to be received badly at first, but the adoption of the special vessels appears to lead to ultimate satisfaction. There are some indications of how to overcome this difficulty. Edinburgh and Yorkshire emphasise the advantages of the utensils by demonstration; this appears generally to right matters.

Including the utensils in the hire charge of the cooker is found to make a big appeal to women at Oldham, while hiring out the pans at a low rate is the scheme at Salford. The Stalybridge undertaking provides a set of special utensils, comprising a three-pint kettle, a 3½-pint saucepan, and an 8-in. frypan or an additional saucepan. Consumers' unwillingness to adopt " proper " utensils at Wimbledon is sometimes overcome by lending them one or more of the articles in each case.



General views of Messrs. De La Rue's press shop (*See preceding pages*)

Electrical Material Prices in 1931

Copper

THE year 1931 was a black one for copper. The declining price tendency already evident in 1929 and 1930 was developed still further, despite spasmodic reactions from time to time, and electrolytic copper, which opened in New York at 10.50 cents per lb., f.a.s., stood towards the close of the year at the record low level of 6.75 cents. Standard copper values in London naturally also touched a record low figure, but, of course, after the British abandonment of the gold standard in September, sterling prices were automatically inflated by way of adjustment to dollar exchange.

In view of the dangerous state of their industry, producers held intermittent conversations with a view to further co-operation aiming at creating healthier conditions. These talks were virtually fruitless at first, although the situation was becoming increasingly menacing. Towards the close of the year, the prospects of agreement being finally reached looked poor, and Copper Exporters, Inc., which handles all sales to Europe, was threatened with collapse. Actually there were secessions, but at the eleventh hour, just before Christmas, a comprehensive understanding was reached. By this the interested producers, representing some 90 per cent. of the world's output, voluntarily undertook to curtail production to about 26 per cent. of their estimated capacity. This arrangement was to remain operative provisionally for a year, or until stocks had been reduced to less than four months' deliveries, or until the price for Connecticut Valley delivery had risen to 12 cents.

The outlook for 1932 suggests the possibility of higher prices in view of the re-alignment of producers, but much will depend on a recovery in consumption.

Lead

Although suffering in common with the rest from the widespread depression which engulfed all industries during the past year, lead has not been quite as hard hit as some other commodities, largely because of the control exercised by the Lead Producers' Association. Nevertheless, with consumption declining seriously that body found it necessary to recommend a 15 per cent. cut in production based on the 1930 output, as from May 1st, this figure being increased subsequently to 20 per cent. on August 1st; this plan has worked smoothly.

Consumption in this country has kept up surprisingly well considering general conditions, but cable makers have been less active than in recent years, and the battery makers also suffered some falling-off in their trade.

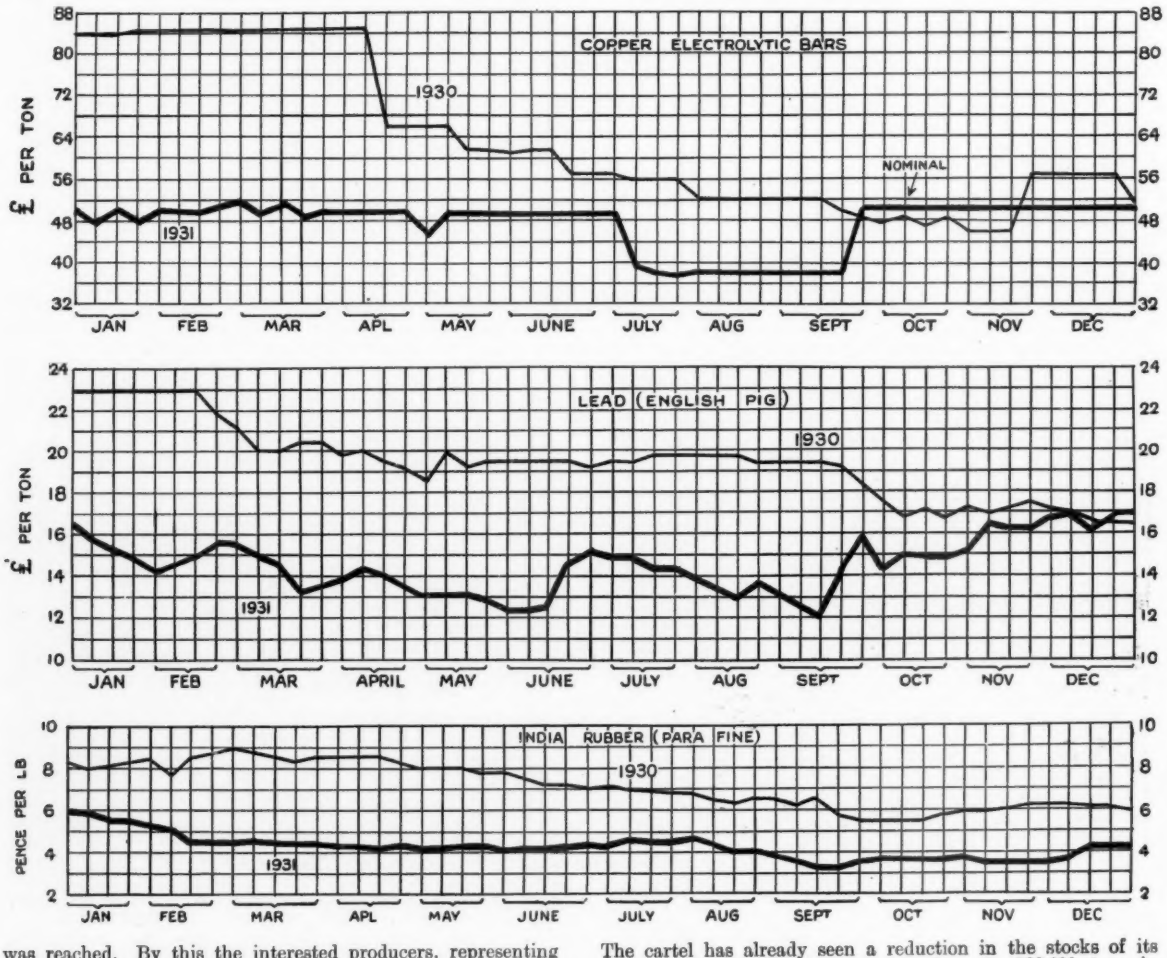
On the Continent the position has shown marked deterioration, Germany's purchases in particular amounting to only a fraction of what are regarded as her normal requirements, whilst Russia's purchases declined somewhat as the year progressed, and French economic conditions worsened rapidly during the second half of the year.

With the full effects of output-curtailment becoming apparent, and a better demand, coupled with the fact that several leading producers benefited materially from the rise in prices, consequent upon the withdrawal of sterling from a gold basis, the lead market appears better than for some time past.

Spelter

The first half of 1931 was characterised by poor demand, easy prices and an irregular but drastic curtailment of output. In June the price touched the lowest level ever recorded. Subsequently, the European, Canadian, Australian and Mexican producers formed a cartel, which enforced on August 1st an output-curtailment to 55 per cent. of the 1927-30 basis, an additional 5 per cent. "cut" taking place on December 1st.

These measures and the abandonment of the gold standard caused a marked rally in prices on the London Metal Exchange.



The cartel has already seen a reduction in the stocks of its constituents from 228,600 tons in June to 186,000 tons in December, and the 1932 price outlook merits some confidence provided world economic conditions do not deteriorate further.

Rubber

The past year has been a disastrous one for the rubber producing industry, prices remaining low throughout, whilst consumption has been very restricted owing to the world depression in industry and finance.

Stocks continued to rise, especially in the first half of the year, and prices touched the lowest level ever recorded in August. During that month efforts were made to bring about a new restriction-of-output plan, which was to include both the Dutch and British plantations. Agreement was not reached, however, and the market remained apathetic until the middle of September, when the suspension of the gold standard in this country gave prices a small fillip and, of course, improved the position of Malayan producers *vis-à-vis* those in the Dutch East Indies.

Nevertheless, the trade demand for the commodity remained poor, and prices unremunerative, and towards the end of the year yet another effort was made to secure agreement between British and Dutch interests for the curtailment of output, on this occasion a cut of between 45 and 50 per cent. being mentioned. Negotiations on this basis are still proceeding.

Power Production at Port Sunlight

High boiler-house efficiency is an outstanding feature of the works' power station

THE Port Sunlight works of Lever Brothers, Limited, is very favourably situated on the Wirral Peninsula alongside the River Mersey some four miles from the outlet of the Manchester Ship Canal. The electrical requirements are heavy, and some 30 million kWh are consumed annually in the works and in the 1,300 staff houses. The maximum demand is 6,500, so that the load factor is well over 50 per cent. The power station, which is about two miles from the centre of the soap works, was started up in 1918. The original installation comprised two 5,000-kW E.E. 3,000 r.p.m. single-cylinder Zoelly impulse type turbines, and 6,600-V, 50-cycle alternators, with three B. & W. c.t.m. stoker-fired boilers, each of 41,000 lb. per hour evaporative capacity. The steam conditions in the original plant were 230 lb. per sq. in. and 650 deg. F.

The Engine-room

In 1929 the plant was extended by the addition of a 3,000 r.p.m. two-cylinder single-exhaust turbo-alternator with a m.c.r. of 6,250 kW. The h.p. cylinder is of the impulse and the l.p. of the reaction type. This set was also supplied by the English Electric Co., Ltd. The condensing plant is also of the English Electric Co.'s manufacture. This set is run continuously on base load for about 6,000 hours, after which it is shut down for routine examination and overhaul.

The three turbo-alternator sets

In the engine room, in addition to the usual gauges showing steam conditions at different stages of the turbines, there are integrating steam-flow meters of the Electroflo type for measuring the output of each boiler, an Electroflo condensate integrator and recorder, and a Kent Venturi boiler-feed recording meter. A condenser leakage indicator is of considerable interest, as it was "home-made" some twelve years ago. A small quantity of the condensate is passed through a glass tank in which is placed a pair of copper plates coupled to a 50-V battery: any increase in conductivity of the condensate is indicated by a milliameter, thus providing an indication of the presence of impurity due to tube failure.

The three machine panels, of the desk type, and the six feeder panels, all of English Electric manufacture, are lodged in an adjacent switch-room. There are also two auxiliary panels and star-point earthing switches. Merz-Price balanced protection is used for the alternators, and the feeders are provided with plain overload.

The Boiler House

The new boiler is again a Babcock c.t.m. type, but the evaporative capacity is 55,000 lb. per hour. The area in square feet of the heating surfaces of its various sections are: boiler, 8,208; water walls, 480; superheater, 2,275; super-imposed economiser, 5,670; and tubular air preheater, 11,286. The stoker is of the boxed-in double chain-grate type, 9 ft. by 18 ft., working with balanced draught. Steam conditions are the same as for the earlier installation. In the new unit a radical departure from previous practice was made by the adoption of "Bailey" water-cooled furnace walls, this being the first stoker-fired boiler in Europe with a furnace of this kind. It is claimed that the design allows the liberation of a maximum of heat per unit of furnace volume, accompanied by a minimum of loss in unburnt fuel and a low maintenance cost.

Repairs and Maintenance

We were informed by the Port Sunlight engineers that the boiler had run from October, 1929, until July, 1930, continuously, and that, apart from the time when it was off the range for insurance inspection in December, 1930, it had been in operation until Easter of last year without furnace repairs.

The boiler was then closed down at the request of the manufacturers for examination after nearly 12,000 hours of service, during which period some 28,000 tons of coal had been burned on the grates, with an average CO_2 at the economiser outlet of 12¼ per cent. The photograph reproduced here shows the appearance of the furnace at that time. No repairs at all were really called for, but, in view of the fact that the condition of the walls warranted an expectation of another long non-stop run, it was considered advisable to renew the Liptak double-suspension arches, although they still appeared good for a few more months' service.

In later designs the Bailey construction is used for the arches also. The principle of the design is the use of refractory cast-iron blocks firmly clamped to 3¼-in. tubes. Intimate contact between the blocks and the tubes is necessary, and this has been obtained by accurate machining and the use of a heat conducting cement. To ensure lateral rigidity, tie clamps are fitted at intervals. The outside of the furnace walls is covered with an airtight non-conducting composition.

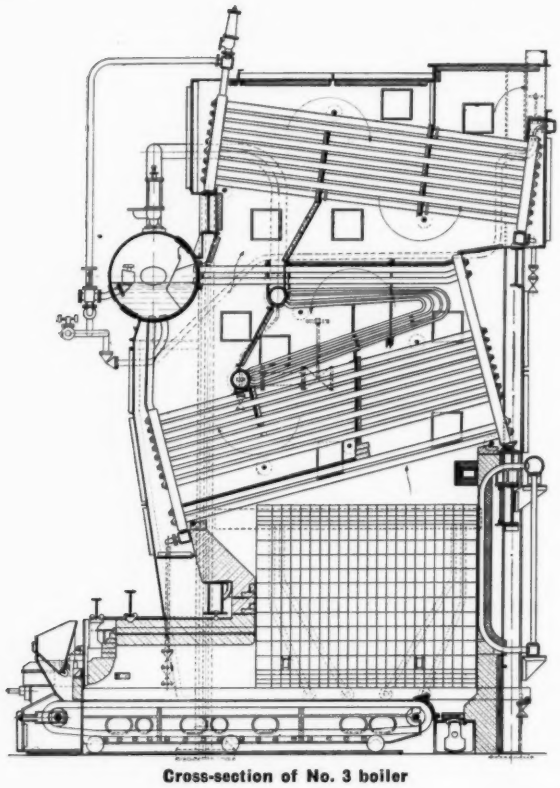
When we inspected the boiler on load recently we observed that slag was adhering only for a space of about three feet from the curvature of the arch at its junction with the walls, and we were informed by the operating staff that the clinker is gently rubbed off at times of light load when it is comparatively cool—never picked or knocked off. A point which appealed to us was that the construction and maintenance of these walls make an engineer's and not a bricklayer's job.

The boilers are arranged to be operated independently apart from their connection to a common steam main. All control is from panels in front of the boilers. This principle extends to the control of the Davidson fans, which is carried out by speed regulation by means of Brookhirst drum-type controllers. The main switches are in the basement, but should any of these trip out, warning is given by the extinction of a red light.

View of boiler furnace after 12,000 hours' service

Operating Records

Very complete records of plant operation—daily, weekly, and monthly—are kept, with a view to maintaining the running of the plant continually under test conditions. The following figures abstracted from the records give a fair indication of the thoroughness of the supervision and also of the excellent operation which enables a boiler-house efficiency of 83 per cent. to be normally attained. The fuel used had a proximate percentage of: Moisture, 7.6; volatile, 31.6; fixed carbon, 52.95; and absolute ash, 7.85. The gross calorific value (as weighed) was 12,677 B.th.u. per lb. The amount burned per hour (fire 2¼ in. thick) was 6,981 lb. (21.2 per sq ft. of grate area) which yielded 126 lb. of riddlings containing 83 per cent. of combustible. Ash and clinker formed 6.8 per cent. of the fuel



Cross-section of No. 3 boiler

burned, and contained 14.3 per cent. of combustible. The evaporation was 58,615 lb. per hour. Feed water temperature entering the economiser was 106 deg. F., and entering the boiler 212 deg. F. Steam conditions were 229 lb. per sq. in. and 664 deg. F., and the total heat per lb. above feed temperature 1,283 B.th.u. Flue gases left the boiler at 604 deg. F., the economiser at 407 deg., and the air preheater at 259 deg. At the air preheater exit their percentage composition was: CO_2, 11.6; O_2, 7.7; CO, trace; and N_2 (by difference), 80.7.

Draught suction in in. w.g. was as follows: over fire, 0.04; boiler exit, 0.47; economiser exit, 0.74; and air-preheater exit, 0.99. The air pressure under the grate was 0.07 in. w.g. Air temperatures entering and leaving preheaters were 95 and 213 deg. F., respectively. Heat transmission (B.th.u. per sq. ft. per hour) was: boiler surface, 6,942; superheater, 3 813; economiser, 1,095. The final heat account gave an overall thermal efficiency of 90 per cent., the balance being accounted for by heat lost in chimney gases (4.9), combustion in ash (1.2), radiation, &c. (3.9).

Water Supply

Well water is used for condensing and general service. The water is raised by three Sulzer 150,000 g.p.h. deep-well pumps driven by 125-b.h.p. Holmes motors. It contains 300 gr. of salts per gallon, and has a total hardness of 140 deg. Boiler feed is distilled in Weir evaporators by exhaust steam bled from one stage of the turbine.

The water supply is, therefore, quite independent of the tidal effect of the river, which is 32 ft. overall; moreover, it never becomes necessary to go to the trouble and expense of cleaning condenser tubes.

The Power Station Staff

The operation staff of the station is a small one. Shift men consist of the charge engineer, driver, assistant driver (who also looks after the pumps), leading stoker, assistant stoker (who also operates the soot blowers), ash-man, three boiler cleaners, general cleaner, and two yard and coal-handling men. Two fitters and mates are also employed.

Our thanks are due to Messrs. Lever Brothers, Ltd., and their staff for their assistance in the preparation of this article.

Less Lacquer! By R. W. Kennedy

An appeal for uncoated bowl-fire reflectors

I WOULD like to suggest that the manufacture of electric heaters embodying lacquered copper reflectors should cease forthwith. Possessing two similar bowl fires, the copper reflectors of which, owing to age and use, were far from bright, I decided to repolish and relacquer them as new. The first bowl to be cleaned and polished was used before the lacquer was applied, and it was found, naturally enough, that the efficiency of the projector had been greatly increased. Indeed, the efficiency of the reflector was such that the polished bowl remained practically cold in action.

I therefore procured a supply of a light amber-coloured product described as "pale gold lacquer" in order that the reflecting efficiency of the brilliantly cleaned copper might not be impaired by any heat-absorbing colour in the lacquer itself. Side by side, the cleaned copper and the lacquered copper were difficult to distinguish, thereby demonstrating that the lacquer was, in fact, both transparent and practically colourless, but alas! the reflecting properties of the lacquered bowl had been seriously diminished.

Quantitative Data

Desiring to obtain some quantitative data concerning this diminished reflecting power, I prepared a small, water-tight tin box, one side of which was coated with optical black. This was exposed for 15 minutes to a clean, unlacquered bowl fire, during which time the temperature of the water was raised 12 deg. C. The experiment was repeated using the same heating element in the bowl after a very thin coating of the pale lacquer had been applied. In the same time the temperature of the water was raised 8.5 deg. C. Taking the unlacquered bowl to represent an efficiency of 100 per cent., this film of practically invisible lacquer reduced its efficiency immediately by 30 per cent. The original dark lacquer on the second fire (not yet cleaned) with the same heating element raised the temperature of the water 5.5 deg. C., thus exhibiting a loss of efficiency of 54 per cent.

In view of the great value of the reflector type of fire, and particularly of the bowl fire, it would appear to be desirable to abandon the lacquered copper reflector with all possible speed and to fall back on stainless steel or chromium plate. The bowl fire represents *the* heating equipment for bedroom and (dare I say it?) for bathroom use. In the bedroom, two bowl fires on the floor, one on either side of the dressing table, provide an area or space of "dressing comfort" that must be experienced to be believed. In sickness, a bowl fire projected on to a person sitting up in bed, provides astonishing comfort in a well-ventilated and, therefore, possibly cold room. In the bathroom, fixed high up on the wall and projected downwards, comfort *and* safety are secured. In this position, however, owing to the downward projection, the life of a lacquered reflector is not worth mentioning.

One is aware, of course, that such downward reflecting fires with chromium plate or stainless steel trough reflectors are already on the market, but, since the bowl fire represents such a simple and useful structure, is it not high time that parabolic reflectors, requiring no lacquer, were universally employed in its construction? In this connection it is instructive to note the everlasting attention devoted to the efficient projection of light. The amount of attention devoted to the efficient projection of heat, however, appears to be almost a minus quantity.

An Amusing Experiment

For the benefit of sundry juvenile onlookers, two highly polished bowl fires were arranged directly to face one another at a distance of eight feet apart. Leaving the element in position in one of the bowls, a bundle of three or four "strike anywhere" matches was placed in the optical focus of the second bowl. On switching on the current to the first bowl, the wad of matches in the second bowl was set on fire with considerable rapidity. In order to heighten and brighten the magical, if not "Magicoal" effect, an electric fan was arranged to set up a hurricane draught at right angles to the path of the rays from the first bowl to the second. Needless to say, the draught in question did not disturb the ether of space! The wad of matches was ignited, despite the hurricane, with just the same ease as before.

Practical Demonstrations at Lectures

Mention is made of this elementary experimental demonstration, carried out with ordinary domestic equipment, simply in order to illustrate a point which I have had in mind for some time, *viz.*, that these and similar experiments in light and heat should be shown to the trade and public at E.D.A. lectures and so forth to the end that a greatly increased interest might be taken in that field of practical physics in which we earn our daily bread.

All too frequently electrical lectures and debates represent little more than a dreary outpouring of the word. Let us have a few fireworks—something to look at—and I believe that the interest both of the trade and of the public in such discourses would be enormously enhanced. Indeed, it is not unthinkable that igniting a wad of matches by means of a couple of bowl fires (the reflectors must be good!) in an electrical showroom might create a very favourable impression of the warming effect, at a distance, of such electric heaters. Window displays embodying similar effects only require working out.

Electro-Plating Equipment

Mass production speeded up by the use of fully automatic plant

THE extent to which electro-plating is employed in the motor car and cycle trades was very evident at the recent Olympia exhibitions. Fully automatic methods of plating have made much advance during the past twelve months, due to the ever increasing demand for speeding up mass production.

While mostly used for nickel-plating, automatic electro-plating plant is also installed for the deposition of copper, brass, silver, cadmium, and zinc, and in fact may be applied for the deposition of any metal when the quantity of work warrants the outlay. It is also made to deposit two metals in their proper sequence, such as copper and nickel, or nickel and silver (or copper) and for carrying out a subsequent oxidising process.

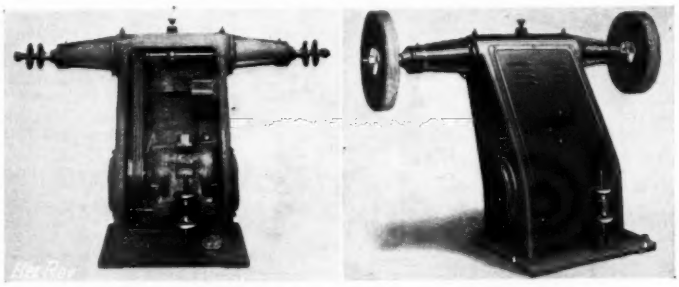
In practice automatic plant has proved to be very successful, ensuring that all operations are correctly carried out with uniform thickness of deposit and improved quality of plating. Other advantages are that continuous output at full capacity is assured and the minimum floor space occupied.

Automatic Plating

The various vats are placed in line one behind the other, in their proper order. Two conveyor chains are arranged to move slowly over the line of vats, running on idler sprockets and supported by runner bars over the length of the vat.

The articles are loaded on insulated suspenders, the latter being arranged in two or three rows on cross rods attached to the conveyor chains. The suspended articles pass successively through all the preparatory cleaning and swilling vats before going into the depositing vat, and finally through swilling and drying apparatus after deposition.

As each loaded cross rod approaches a vat it is lifted bodily (complete with suspenders) by an auxiliary fast-moving "transfer" chain and lowered into the next vat along the line. The fast-moving change-over chain reduces the time



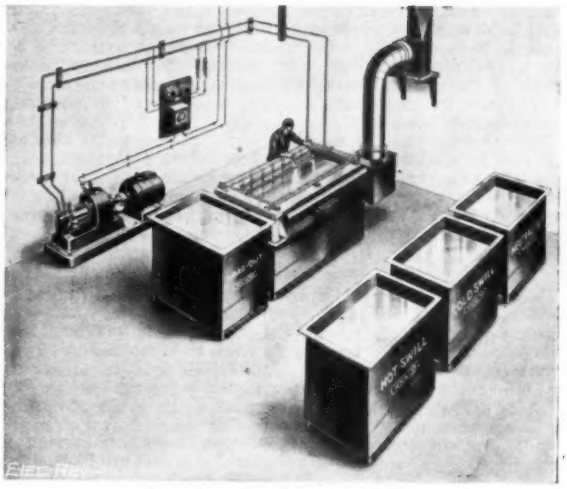
Motor-driven polishing lathe with enclosed drive

the articles are out of the solution, so that there is little possibility of the work becoming dry before it is passed into the next vat.

After passing through the drying-out apparatus, the suspenders are unloaded off the cross rods, and the latter are automatically returned to the loading position. Transfer towers are erected at intervals along the plant; these are provided with suitable brackets to carry the guide bars, supporting angles, and sprockets with which the conveyor chains engage.

Each set of transfer chains is driven through worm gearing by a shaft which runs the whole length of the plant, and is driven at the correct speed by the main reduction gear box. Above the electro-cleaning and plating vats are fitted copper angle-section conductors at such a height that when the cross rods are lifted over into the vat, slippers on the rods make contact with the conductors and slide on them while being carried over the vat. These copper conductors are connected to a low-voltage plating dynamo, and thus the necessary electrical connection is made to the articles which are under treatment.

The whole plant forms a very compact unit, all movements being operated by one electric motor driving through reduc-



Chromium-plating equipment

tion gear, which gives the required travel for the two sets of chains, thus ensuring perfect synchronisation of the transfer chains and at the same time maintaining the correct period during which the articles to be plated must remain immersed in the solution.

The various vats are designed to allow of the articles remaining in a particular vat a relative predetermined time, which cannot be altered without modifying the plant, although the actual time taken by the work to travel from one end of the plant to the other may be varied at will. Thus, if it is desired to increase the time for deposition, the treatment in all the other vats is lengthened in the same proportion.

Usually a drying oven is placed at the extreme end of the apparatus, which thoroughly dries the articles after they have passed through the cold and hot swilling vats which follow the plating.

Chrome Plating

The properties of chrome plating are now well known; it is stainless, untarnishable, and requires no polish, but a word or two regarding the peculiar essentials of the plant in order to ensure success with ordinary labour may not be out of place.

The solution is contained in a special tank provided with suitable means for heating by steam, gas, or electricity, and complete sets of cathode and anode rods and anodes are fitted to suit particular requirements. For removing the fumes evolved during the plating process the system of exhaustion and condensation fully protects the health of the operator, and yet does not impede rapid and economical output.

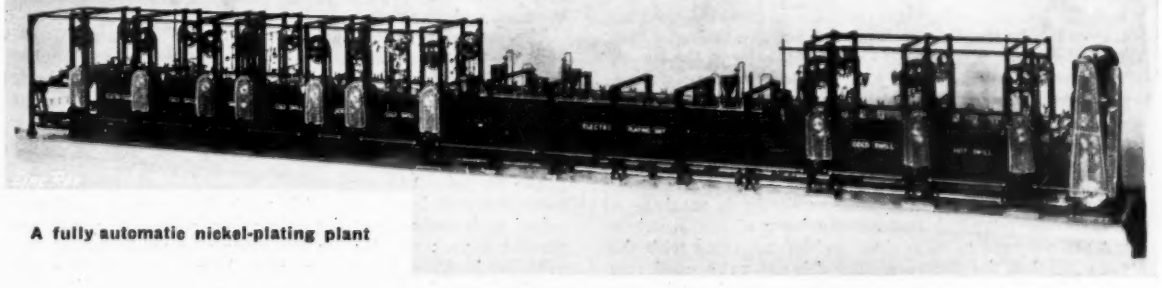
"Zonax" bright chrome solution is now used exclusively. It was evolved after intensive research and experiments in the Canning laboratories to find an electrolyte which would "throw" well without "burning." Articles plated in this solution are given a deposit so bright that very little finishing or final polishing after plating is required. The amount of current required to obtain a satisfactory deposit has also been lowered, so that to-day the expenditure on power is not abnormal.

With an efficient plant chrome plating is not more difficult to carry out than any other form of electro-deposition; it is very necessary, however, to install the right equipment, or disappointment is bound to result. Sufficient current is essential, and so is an efficient tank, designed on the right lines to exhaust the fumes without obstructing the economical working of the plant.

Portable Filters

Two portable filtration units of recent design have for their object the prevention of accumulation of foreign matter in the bottom of a plating vat, a subject of great importance to the plater, as it affects the quality of the results, particularly when warm agitated solutions are used.

When a filter unit is not fitted integral with the vat one or



A fully automatic nickel-plating plant

other of these portable outfits will be found invaluable; one is motor driven, the whole being mounted on a truck, and the other is hand operated. The motor-driven unit consists of a pump and filter chamber with suction and delivery hose, mounted on a light truck, making a self-contained mobile outfit ready for immediate use and easily placed in position alongside any vat.

The filtering head is made of acid-resisting metal and is clamped to a container which is firmly bolted to the truck. The actual filtering media are attached to the head. An acid-resisting motor-driven phosphor-bronze pump, which has a capacity of 300 gallons per hour, is mounted on a cast-iron bedplate bolted to the truck.

Polishers

One type of electric polishing motor is of the squirrel-cage type constructed to run at suitable periodicities to give efficient polishing speeds. The outstanding feature is the extra bearings for the spindle where they are most necessary. The snout is provided with a bearing at the end in order to strengthen the spindle to withstand the polishing load.

While affording support to the spindle, the snout offers no more obstruction to the operator than the plain extended spindle. The motor is therefore equipped with four bearings, two on the inner shields of the motor and two at the outer ends of the snouts. The spindle is fitted with detachable taper-screwed false noses at both ends, so that when a screw becomes worn the false nose can be removed for re-threading, or a false nose can be fitted without dismantling the machine. Clamping plates and nuts can be fitted at either or both ends of the spindle for mounting emery wheels.

Another pattern has been designed to provide correct polishing speeds on a.c. or d.c., and to give ample clearance around the mops for polishing large and awkward articles. The machine consists of a polishing spindle running in four ball bearings, two in the main casing and two in the overhanging snout bearings, an arrangement which ensures perfect running. The whole is fitted in a substantial cast-iron casing, which also contains the motor and drive.

The spindle is driven by multi V-belt, the motor being mounted on an adjustable pivoted plate fitted inside the main casing. The starter is carried inside the main casing, and is operated from the front of the machine. To facilitate quick and safe changing of the mops, the spindle can be locked by a hand-operated plunger provided on the top of the machine. The back of the machine has a sheet-metal cover which can easily be removed to give access to the motor, starter, and drive. An inspection door is also fitted on the front of the machine. The arrangement of the bearings in the casing is such that the spindle may be easily withdrawn after the removal of one of the overhanging bearings.

Messrs. W. Canning & Co., Ltd., to whom we are indebted for the above information and illustrations, also produce many other plating accessories and materials.

Control of Small Motors for Intermittent Running

THE advent of traffic signals, automatic station indicators, and the growing use of small motor-driven apparatus for moving advertisement displays has opened up a new field for the small control gear designer.

The many and varied uses to which the small motor is adapted must have taxed the ingenuity of the men whose job it is to provide the means of automatically starting, stopping, and reversing the motor. The time switch, of course, plays an important part in most of these devices, but the concomitant apparatus necessary for the complete control of the device calls for a skilful designer with original ideas.

One interesting method of motor control, by means of which working devices having operating periods of different duration may be set in operation simultaneously, and automatically thrown out of operation after their several working periods, is shown diagrammatically. This method of control could be applied to electric train and tramcar stopping-place indicators, moving advertisement displays, &c.

The diagram shows four electric motors, each of which may be assumed to be driving an indicator, and associated with each are an electro-magnetic switch A, B, C, D, and a rotary switch E, F, G, H. The switch *a* may be a time or other mechanically or electrically operated switch provided with a dash-pot time lag or some such retarding device to delay the return of the switch arm to the contact *y*, after it has engaged with contact *x*.

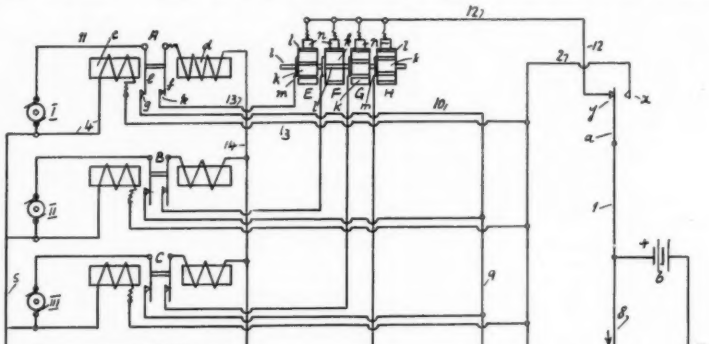
The electro-magnetic switches A, B, C, D, consist each of two electro-magnets *c*, *d*, with connected armatures *e*, *f*, interposed between the magnets, so that when the armature *e* is attracted by the magnet *c* the armatures are in engagement with the stationary contacts *g*, *h*. The rotary switches E, F, G, H, consist each of a cylinder *k* of non-conducting material on the periphery of which are fitted conducting strips *l*, spaced to suit the required working period of the relative motor.

The strips of each rotary switch are electrically connected with each other and with a stationary lateral rubbing contact *m*. Engaging the periphery of each cylinder *k* is a stationary rubbing contact *n*, engaged successively by the strips *l*. When the motors are at rest the contact *n* of each rotary switch is in engagement with one of the strips *l*. The rotary switches themselves are operated by the low-speed shaft of the corresponding motor drive.

When the hand or automatic switch *a* is operated, making contact with *x*, current flows from the positive main by way of the conductors 1, 2, 3 and the electro-magnet *c* of the switch A; then through the conductors 4, 5, 6, 7, back to the negative. The electro-magnet *c* is excited and attracts the coupled armatures *e*, *f*, engaging them with the contacts *g*, *h*. Consequently current flows from the positive through the conductors 8, 9, 10, through the armature *e* and the conductor 11 to the motor and back to the negative by way of conductors 5, 6, 7. The motor is started and the rotary switch begins slowly to revolve.

Owing to the retarding feature, the lever of the switch *a* has not yet returned to its orginal position engaging with the contact *y*, so that the electro-magnet *d* is not yet excited. As the rotary switch rotates, the contact *n* is engaging with the insulated part of the drum and by this time the lever of switch *a* has left contact *x* and returned to engagement with contact *y*, so that the electro-magnet *c* is no longer excited, although the armatures *e*, *f*, retain their positions in contact with *g* and *h*, so that the motor continues to run. Upon further rotation of the drum of the rotary switch E the contact *n* engages with a strip *l*, and current flows from the positive by way of the conductors 1 and 12, contacts *n* and *m*, conductor 13, armature *f*, electro-magnet *d*, and conductors 14, 6 and 7, back to the negative.

The electro-magnet *d* which is thereby excited attracts the armatures, *e*, *f*, which thus leave the contacts, *g*, *h*, so that



Automatic Control Diagram

the circuit to the motor is broken and the last named comes to rest: at the same time the circuit to the electro-magnet *d* is again interrupted by the disengagement of contacts *f*, *h*, and the apparatus is ready for the next closing of switch *a* to repeat the operations.

Exactly the same sequence of operations actuates the other three motors through their respective electro-magnetic switches and rotary switches. Though all are started simultaneously by the operation of switch *a*, they are brought to rest independently after having run for intervals governed by the predetermined distances between the strips 1 on the drums of the rotary switches, E, F, G or H, and the speed at which the drums are arranged to rotate.

The electro-magnetic switches A, B, C, D, consist essentially of two co-axial solenoid coils whose interconnected cores, when in both end positions, assume an effective position only in relation to one of the two coils and in one end position are held in circuit with *g*, *h*, by springs, so that the circuit is maintained through *e*, *g* and *f*, *h*, when the electro-magnets *c*, *d*, are no longer excited.

The provision of a time switch or constant-stroke motor for actuating switch *a* makes this method of control eminently suited and easily adapted to changing indicators, which are becoming very popular for advertising in public places and vehicles, both in this country and abroad. Many other uses can be found for this system. W. E. G. W.

Correspondence

Correspondents should forward their communications as early as possible. No letter can be published unless we have the writer's name and address in our possession

Canvass the Country

I think possibly you have made a mistake in your diagnosis of the complaint from which the electricity supply industry of this country is suffering.

I do not think there is any real lack of technical commercial ability to sell electricity. Many of the municipalities are doing quite well in this respect and find no difficulty in obtaining a staff with the necessary qualifications. I think the trouble rather is a lack of any desire on the part of many authorised undertakers to sell cheap electricity for domestic use. I doubt whether many of them believe in it themselves and whether they use it in their own homes.

If, in these circumstances, you turn out by intensive training an army of super-sellers, I fear that the result will be that they will dispose of cookers, water heaters, and other electrical appliances in situations where the rate per unit is not competitive with other means, and thus do more harm than good. The apparatus will come back at the end of the first quarter if it is on simple hire, or if it is on hire-purchase the customer will have to keep it, but this will not be an advertisement in our endeavours to encourage the use of electricity by other people.

I do not think you will be able to persuade the backward supply undertakings to offer competitive terms for electricity for these purposes of their own free will. I think you will have to compel them to do it by means of a universal tariff to consumers fixed by some national body at a uniform rate for each of the grid districts. It should not be very difficult to agree on some standard tariff which would be applicable everywhere in a given area.

Before this comes about, however, it will be necessary for all authorised undertakers to buy at uniform prices from the national grid system in each of these districts, and then they will have no excuse for maintaining a high rate to the customer. At present, places near the grid are being quoted satisfactory terms for the purchase of electricity, while places only 12 or 15 miles distant are being quoted figures 30 per cent. higher, although all the places are contributing uniformly to a levy for the standardisation of frequency. This is obviously unfair, and I do not think very much headway will be made until it is put right.

It will be argued that a fixed uniform tariff to the customer would take away the freedom of the authorised undertaker, but seeing that the Electricity Commissioners already tell us how, when and where we may, or may not, spend our money, and that the Central Electricity Board tells us the price at which we are to buy, is it really worth while worrying about the loss of the little freedom that is now left to us?

H. WILSON,
Electrical Engineer.

Electricity Works, Ashford,
December 22nd, 1931.

The "Cheap and Abundant" Supply

"Protection" in his letter of December 19th mentions that vexed problem "Tariffs." Surely this is the most important of all. What is to be the price per unit of the "cheap and abundant" electricity promised?

I do not think the Central Board ever promised cheap electricity, but the politicians did. We hear of 10 per cent. on rateable value and ½d. per unit, and a few miles away a price in the neighbourhood of 1s. per unit. Then we hear of a huge deposit to be paid before a supply can be given to a works.

I am shortly giving up travelling after twenty-five years of not unsuccessful salesmanship among every conceivable type of producer and consumer of electricity, and none of them could tell me what "cheap electricity" meant. The nearest I could get to it was, "The price at which we can afford to sell it when we have paid all our charges," which is not a very satisfactory definition.

I am afraid I have never had time to interest myself in the Commercial Association, but it looks as if I shall have plenty of time to do so in the future.

COMMERCIAL A.M.I.E.E.

December 28th, 1931.

Still the Boiling Plate

In your issue of December 18th Mr. C. E. Baxter replies to my letter of December 11th, but there is really not much difference between his point of view and my own as he will see if he rereads my letter. I did not state that we could not look for any improvement in the present enclosed type of hot-plate: what I did say was that it was efficient if used with the proper type of utensil.

I quite realise that efficiency can be a comparative term, but what all those engaged in supplying electric cookers to the public have to keep in mind is that probably 90 per cent. of the cookers sent out during the current year have been supplied with the enclosed type of hot-plate.

Having regard to this, is it not rather inconsistent on the part of all those engaged in this industry not to make sure that these cookers are giving satisfaction? Yet it is left to chance whether a woman takes 30 or 40 minutes to heat up food which could be just as easily heated up in 12 or 14 minutes if she used the correct type of pan.

It is highly probable that of the 90 per cent. of the electric cookers sent out during the year, no more than 15 per cent. have been supplied with the correct type of utensil, nor are they being used to-day with the proper type of utensil. This means, therefore, that 75 per cent. of the cookers still going out with the present type of enclosed hot-plate are being used more inefficiently than need be, which means a very serious waste of both time and electricity.

Can you imagine the disastrous effect it would have on the motor car trade if, after the designer of an engine had improved on its efficiency, nothing else was done to improve the efficiency of the whole chassis?

What is the use, however, of any improvement in the design of enclosed hot-plates when those who are responsible for their use afterwards do nothing whatever to make sure that the hot-plates are going to be used efficiently by supplying the correct type of utensils for them?

Fortunately, many electricity supply departments are completely changing their point of view in order to prevent the return of electric cookers and the substitution of gas cookers. This is not a matter of dogma but merely one of ordinary common sense and business foresight in seeing that the article supplied to the public is to be used under certain advantageous conditions. Irreparable harm can be done to the whole industry of electrical cooking when those who are at present using cookers are only lukewarm supporters.

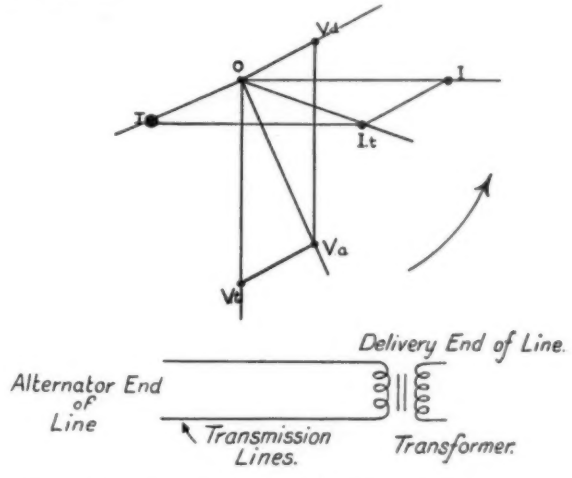
HAGUE & MCKENZIE, LTD.,
T. M. Veitch, *Director.*

Birmingham,
December 21st, 1931.

Transmission-line Phase Relations

In your issue of November 20th, 1931, you published an article of mine entitled "Electrical and Mechanical Resonance" in which mention was made of the fact that in an a.c. power transmission line it is possible at no load for the voltage at the delivery end of the line to be materially higher than that at the power station end; in the actual example cited the pressure was 15,000 V higher.

This phenomenon, due to the phase relations of the voltages and currents involved, is explained very simply by the following vector diagram in which the lengths marked off along each vector represent the actual values of these quantities to any suitable scale.



The diagram also gives the transmission line circuit in which:—

- O.T. = transformer magnetising amperage, which lags nearly 90 deg. behind *vt*.
- O.I. = condenser amperage due to the capacity of the circuit, which leads 90 deg. on *vt*.
- O.*It*. = resultant amperage in circuit flowing along the line.
- O.*Vt*. = voltage across transformer terminals.
- O.*Vd* = voltage drop along line.
- *Va* = voltage across alternator terminals.

It will be obvious from the vector diagram that *vt* at the delivery end of the line is higher than *va*, the voltage at the station end.

Manchester, *December 24th*, 1931. B. J. SHILLITO.

Electric Clocks

Your correspondent Mr. P. S. Bush has experienced the freedom from interruption of a.c. supply which all consumers hope for. He has been fortunate because some London districts have since April last been without current for hours. In the case of lighting, when the supply is resumed after a failure all is well and nothing has to be done but to enjoy the light.

In the case of synchronous clocks, however, the work of the custodian of the clocks then commences, because all clocks have to be visited independently and put forward to time, and

the trouble experienced through engaged or locked rooms often means that two or three visits have to be made before access can be gained to some of them.

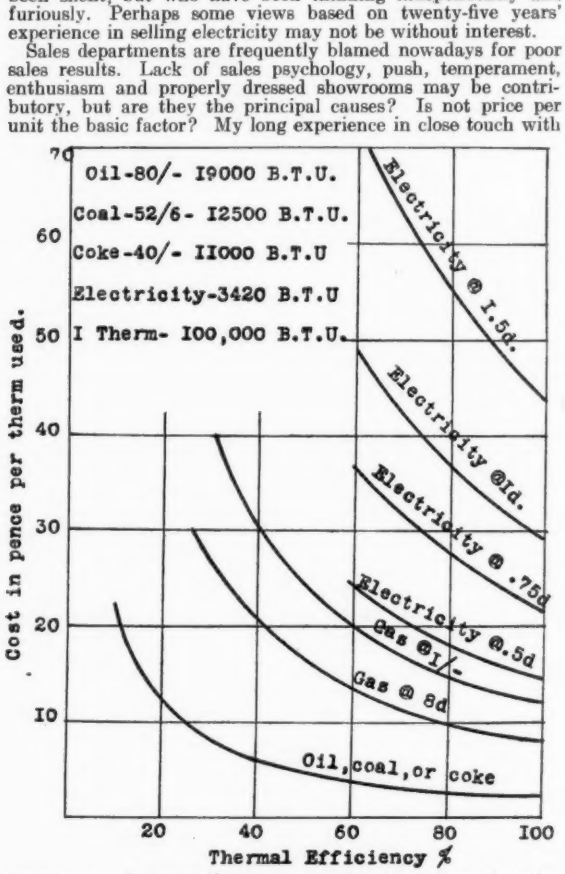
While these clocks are excellent for positions where one or two only are required, I am still of the opinion that impulse clocks are the better in an installation consisting of a number of clocks. One then has complete control from the master clock. I am not prejudiced against synchronous clocks; in fact, one is doing its duty at my elbow while I write, but it took a short rest yesterday mid-day through current interruption, as also did the lights.

ALFRED E. BALL, F.B.H.I.
Leicester, *December 21st*, 1931. (*Gent & Co., Ltd.*).

Electricity and its Competitors

In a recent inspiring leader, the ELECTRICAL REVIEW invited frank expressions of opinion from those who have hitherto been silent, but who have been thinking independently and furiously. Perhaps some views based on twenty-five years' experience in selling electricity may not be without interest.

Sales departments are frequently blamed nowadays for poor sales results. Lack of sales psychology, push, temperament, enthusiasm and properly dressed showrooms may be contributory, but are they the principal causes? Is not price per unit the basic factor? My long experience in close touch with



consumers and prospective consumers has taught me that the conservative, apathetic, but withal severely practical British public are surprisingly well informed. They have to think twice to-day before embarking on new ventures, and they are not easily "sold."

The great majority are well aware that electricity for cooking and heating is very nice, clean, and convenient, and therefore most desirable. A considerable proportion, however, have heard that it is too expensive, and many have found it so by bitter experience. Such experiences have probably retarded progress to a greater extent than will be admitted. Are not tariffs, particularly the "unit" price in two-part tariffs, too often fixed without due regard to the important relationship between cost per therm and thermal efficiency, not only of electricity, but of its competitors?

The mere mention of thermal efficiency will doubtless provoke a storm of criticism. One hears that in selling electricity, thermal efficiency can be ignored; that, if you are a salesman, you should be able to sell it at any price! And so you can—a certain insignificant amount, and there the sales will usually stick until the price is reduced. There is much to be said for starting at a competitive figure.

Before inquiring why sales for cooking and water heating do not quickly reach the proportions sometimes expected by enthusiasts, perhaps a study of the above curves may bring some enlightenment and, let us hope, a revision of some tariffs now in force.

It is truly astonishing (though not generally realised) how most women will literally wallow in dust and fumes, suffer amazing inconvenience and discomfort, and lose half a lifetime in order to "save," as they falsely imagine, the few pence or shillings per week, which may appear to be the extra cost of doing things electrically.

To the advanced salesman all this may seem elementary, but junior salesmen should make it their constant study and endeavour to educate women to the true economy of electricity, to bring it home forcibly to them that if electricity itself costs a little more than coal, oil, or gas, it is very well worth it, because of the real saving in £ s. d. that electricity can effect, and its many other advantages that cannot readily be expressed in money.

The cost of any competitor is not represented by the cost of the fuel, although the accompanying curves show that at the lower prices of the more enterprising authorities, the extra cost of electricity over the cost of fuel is small if any. Take storage water heating, for example. At ½d. and 90 per cent. efficiency (an average easily obtained) the cost closely approaches 8d. gas at 50 per cent. efficiency, and of other competitors at 15 per cent., which is probably higher than is usually obtained between fuel and water, because a large proportion of heat generated is rarely used. It may be argued that the wasted heat serves to air the linen and warm the house in winter; true, but often to an uncomfortable and extravagant degree, particularly in summer.

Certain modern types of gas heaters may exceed 50 per cent. efficiency, but even supposing it is 75 per cent., many will gladly pay the difference rather than have a dangerous foul-smelling appliance anywhere, least of all in a bathroom, that may at any time become a lethal chamber.

At any price much higher than ½d., however, it will be seen that electricity for water heating soon becomes prohibitive (except for small quantities) and in excess of what the average householder will pay for it, despite its unquestionable and admitted superiority.

As regards cooking, few will argue that the overall thermal efficiency of the very latest electric cooker is higher than 75 per cent., including boiling plates and grill. Again, compare this with gas at 40 per cent. and other competitors at 10 per cent. Yet some authorities expect to sell electricity freely at 1½d. for cooking, even where the prices of competitors are high. A glance at the curves should suffice. Did not a well-known supply engineer recently state in the ELECTRICAL REVIEW that no one but a fool or a millionaire could afford to use electricity for cooking at 1½d.? At 1d. it is just competitive with 1s. gas at from 30 per cent. to 40 per cent. efficiency. At the lower prices now charged by many enterprising authorities, however, electricity for cooking and water heating is keenly competitive and sales should and could rise by leaps and bounds.

The public has long been accustomed to paying for what they consume only. Why seek to convert them? Why not a standard domestic two-part tariff, with a reasonable fixed annual quota of units based on number of living rooms, at a high rate per unit, and a really low and competitive unit price for all consumption above the quota? No quarterly payments in advance. No meter rents. No alternative tariff. If the low unit price is right, electricity is three parts sold, and sales departments may be trusted to do the rest.

December 28th, 1931. THERM.

A Blot on the Landscape

I am much interested in your article in this week's ELECTRICAL REVIEW on "Transmission in the Highlands."

As a Scotsman and a lover of my native country, I must, however, take exception to the paragraph on page 908, in which the writer states: "The lines run through some of Scotland's most beautiful country and they certainly in no way mar any of the wonderful views. Indeed, the engineer mind could be excused readily for claiming that the beauty of the countryside has been enhanced, for there is certainly something majestic about many of the structures rising from the rugged hillsides."

It is no doubt a splendid engineering job, but the poles and lines are a hideous blot on the landscape, and no one with any love of beauty could think otherwise. I know the district, intimately, all the way from Tummel Bridge to Perth.

ALLAN ARTHUR, A.M.Inst.C.E., A.M.I.E.E.
Glasgow, *December 21st*, 1931.

The Process Steam Bogy

Referring to the editorial comment upon the above subject in your issue of December 18th may I suggest that a most unfair reflection is cast upon this vastly interesting matter?

As an engineer who not only runs the system, but stoutly upholds it, may I state a few facts: First, no engineer who knows process steam work is foolish enough to imagine that he is getting steam for nothing! It cannot be done theoretically or practically. But that the system pays I have proved beyond question.

The great secret of the system is the enormous prevention of waste, which is possible with proper management. This adequately covers your remarks regarding the whole of the heat not being required. The system should be so loaded electrically as to balance exactly the steam demand on the process side, any additional power being taken by the local public supply.

The local supply engineers are inclined to challenge our process steam costs, but if the thing is properly run they have no case. I quite admit that to estimate the cost per kWh on process generators is extremely difficult, but the gain can be proved.

I am all in favour of "Canvassing the Country," but I sincerely trust that works engineers sufficiently know their business to realise when they are on a good thing.

M. S. BYER.
Warrington, *December 19th*, 1931.

New Apparatus and Devices

for Domestic, Cooking and Heating, Lighting, Power and Scientific Purposes

" Bakelite " Torches

The latest addition to the extensive range of " Bakelite " accessories marketed by the GENERAL ELECTRIC CO., LTD., Magnet House, Kingsway, W.C.2, is an electric torch. The outstanding advantage of the moulding in this instance is its high insulation value. All chances of short-circuiting and leakage of the battery are countered by the case, while corrosion is eliminated. Furthermore, the appearance is pleasing and retained indefinitely. The torch is cylindrical in shape, with a slightly bulbous cap and base, and it is finished in a speckled brown colour. Its sliding switch, bronze finished, is sturdily made and ensures firm contact, while the lens, backed by a polished-aluminium reflector, is so fitted in the cap that there is no likelihood of its becoming accidentally dislodged.

An unusual feature is that when the base cap is screwed on the metal liner fitted in it rotates and thereby engages the metal strip extending from the switch with a rubbing action which serves to clean the contacts. Made in two sizes, 7 in. by 1¼ in., and 9 in. by 1¾ in., the torch is designed to take " Osram " lamps of 2.5 V and 3.5 V, respectively, and also " Magnet " torch batteries.

A New Condenser

The new T.C.C. inverted type aqueous electrolytic condenser for radio work

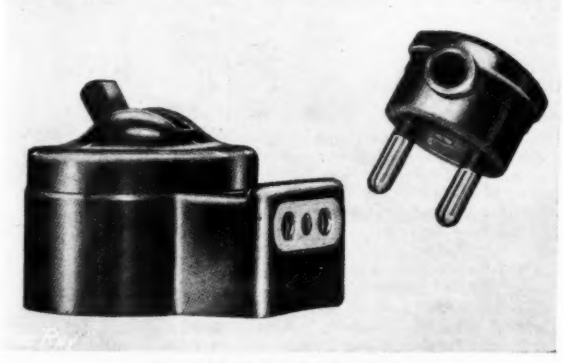
The new inverted type aqueous electrolytic condenser of the TELEGRAPH CONDENSER CO., LTD., Wales Farm Road, North Acton, London, W.3, is designed on the same principle and is constructed practically on the same lines as the previous types marketed by the company. The new pattern is, however, arranged for one-hole fixing through the chassis in accordance with the demands of modern commercial radio receiving sets. The sample illustrated has a rated capacity of 8 mF., and is suitable for working up to 440 V d.c. At present this type is not available to the retail market, all supplies going direct to set manufacturers.

Gas-proof Electric Handlamp

Messrs. WATTS, FINCHAM & CO., LTD., Billiter Buildings, 22, Billiter Street, E.C.3, have recently introduced an electric hand lamp (" Wefco ") designed for use in petrol stores or other places in which precautions have to be taken against the risk of explosion. The lamp is contained within a casing of aluminium alloy, all joints, including that at the switch-button, being gas-proof. A special key has to be used to open the lamp, and this is intended to be kept in charge of a responsible person. The accumulator is cylindrical and of the steel-alkaline type with a continuous lighting capacity of about ten hours. The outfit has a convenient handle and weighs 5¼ lb.

A Safety Switch-plug

An outstanding feature of an all-insulated switch-plug recently introduced by M. K. ELECTRIC, LTD., Wakefield Street, Edmonton, N.18, is the heavily reinforced and exceptionally strong switch dolly. The cover is fixed by two small screws, so that it cannot readily be removed by children or unauthorised persons. The switch has a positive action with independent quick make and break. The patent spring-grip sockets are deeply recessed and enclosed by an insulating disc. The object of a spout entry for the flexible leads on the plug is to eliminate any tendency for the flexibles to break as the result of sharp bends. There are no cord grips; the conductors are accommodated in channels which prevent twisting and splaying, and are securely held by substantial hexagon nuts. A useful innovation in plug design is the insulation of those portions of the pin which do not enter the sockets, thus affording protection against careless handling of the plug. The cover and base are held together by one central heavy screw, and the whole arrangement is designed to facilitate wiring. These robust switch-plugs are available with white or brown covers on white or brown bases, and are rated at 15 A (B.S.S.).



Easy-wiring M.K. switch-plug

An Engineer's Combination Tool

The " Eclipse 4S " tool recently introduced by Messrs. JAMES NEILL & CO. (SHEFFIELD), LTD., Composite Steel Works, Napier Street, Sheffield, should prove very useful to all engineers, and it will serve the electrical man for a hundred and one purposes. The complete set consists of a nickel-plated holder of special design, six double-edged slotting blades (two each of Nos. 23, 21 and 18 gauges), six single-edged sawing blades of No. 23 gauge, one half-round and one flat engineer's scrapers, and one belt- and lead-slitting knife. The holder is designed so that when used for sawing or scraping it is in line with the tool, and when employed for slotting or slitting it will provide clearance for the operator's fingers. Commutator-mica undercutting is one of the many uses for which the slotting blades are suitable. The blades are shaped so that the work can be done right up in the corners, and their teeth are unset. The saw blades are suitable for all classes of short-stroke work where a hack saw cannot be used. The cutting edges of the scrapers are carefully ground to ensure accurate work, and the similarly treated edges of the slitting knives have a bevel on one side only. All the tools are made from the company's tungsten steel similar to that used for " Eclipse " hack-saw blades. The tool-ends are secured in the holder by a set-screw and with a definite angular lock. The complete outfit is supplied in a tin case with separate compartments for the tools.

A many-purpose tool (as a mica undercutter)

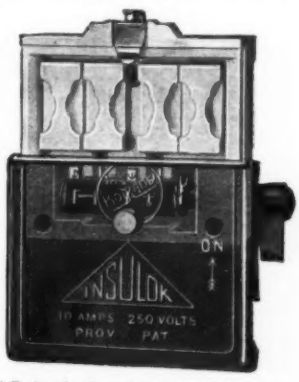
New Reflector and Clip

A weatherproof " Straight-Lite " reflector recently introduced by STRAIGHT-LITE REFLECTORS, LTD., 65, Camden Road, N.W.1, consists of a leaded iron angular case containing the maker's type of polished aluminium reflector. It is fitted with a hinged glass front with bolt fastenings, and it is carried on two brackets with fly nuts for adjustment. The outside is finished in japanned black.

A hinged fixing clip for use with " Straight-Lite " reflectors has recently been marketed by the company. It is made of spring steel with a non-rusting and polished finish. The hinging of the clip allows for adjustment of the reflector to the desired angle.

All-insulated Switch-fuse and Switch Splitter

What is claimed to be the first interlocked all-insulated combined switch-fuse and switch splitter to be introduced is the " Botrade Insulok " just marketed by Messrs. S. BILL & CO., LTD., Queens Road, Aston, Birmingham. A heavy " Bakelite " cover slides on to the switch case of English vitreous china, and by a suitable stop, when the cover is in the normal open position, the switch portion of the unit is concealed and it is impossible to touch accidentally any " live " metal. The cover is secured in the closed position by a spring clip, and holes in this clip and the cover stop external projection afford a convenient sealing arrangement. No metal parts pass from within through the cover or base. The cover is interlocked with the operating lever so that it cannot be opened with the switch " on." The switch has a positive quick-make and -break action, the brushes are of copper and are self-aligning, and the " Bakelite " brush bar works on metal bearings to eliminate undue friction. Strong pressure contact is afforded by the high-conductivity phosphor-bronze contact clips. The fuses are of the makers' arc-damping type, with h.c. phosphor-bronze contacts. Unobstructed passages at both the top and bottom for the cables facilitate wiring. These features are embodied in both a switch-fuse and a splitter unit with two fuses on each pole. Both equipments are rated at 10 A, 25 V, and Birmingham University tests showed that currents as high as 85 A could be broken successfully.



" Botrade Insulok " switch-fuse splitter with cover open; " ghost " view of switch

The British Radio Industry

VIGOROUS efforts are being made by the Radio Manufacturers' Association, and by individual firms in the radio industry, to increase exports of British wireless goods, and to follow up the encouraging start made at the Olympia Radio Show by several manufacturers to develop an export business. Immediately after the show several firms reported very promising progress in that direction, and an attempt is now being made to extend the movement on a wider front in a much more comprehensive manner and with redoubled vigour. There is no doubt that similar action would be highly beneficial in other electrical branches.

At a luncheon recently held in London which was attended by several of the leading manufacturers and also by representatives of the Radio Manufacturers' Association and the Department of Overseas Trade, the suggestion was at first made that a separate organisation outside the R.M.A. should be formed to deal with the export business, on the assumption, apparently, that that body had not put sufficient energy into the work; but this suggestion was not acceptable to many of those present. In view of the useful work which the R.M.A. had already carried out, it was generally agreed that it should be continued by the same body, strengthened and invigorated if need be by additional support from the industry.

For instance, the present council of the R.M.A. should give its whole united attention to the matter and not leave it in the hands of a committee, and should further co-opt men from outside who had special knowledge and experience of export problems. It might even go farther than this, and appoint a full-time salaried officer, with expert training in this particular field to take charge of the export department.

Assistance from the D.O.T.

The representative of the Department of Overseas Trade, Mr. G. E. C. House, said that his Department would welcome very warmly any further efforts of British manufacturers to increase their trade in overseas markets, and would support them by every means in its power. He expressed a wish, moreover, that British manufacturers and traders, not only in the radio, but in other electrical trades, would avail themselves more fully of the services of the D.O.T.

Another useful suggestion was that the R.M.A. should take part collectively in the next British Industries Fair, which will provide a very effective medium for bringing the attractive qualities and low prices of British wireless goods to the notice of foreign buyers.

As a result of the work which the R.M.A. has been doing for the past few months in exploring the possibilities of increased export trade under the changed international currency conditions, a confidential document in the form of an export schedule has just been issued to member firms of the Association. This is at present only in draft form and will probably be amplified later on.

It is pointed out in a preliminary statement in the schedule that the terms of the various agreements with the patents licensing pool—the Marconi group—must of course be complied with in regard to wireless goods exported; and that, in any case, sanction cannot be given for export to certain countries, which constitutes a rather formidable limitation to the export field.

It is felt, indeed, in some quarters that the licensing pool might be a little more generous and helpful towards those British manufacturers who are making strenuous efforts to build up an export business. It is true that the terms of the new licence are somewhat better than the former one, but the whole patent position is still difficult and tends to restrain the activities of the industry at home and abroad.

Even though the prices of British valves, for example, have been considerably reduced during the last few months, they still cannot compare with American prices, and this to a large extent is due to the royalties charged on British valves.

Market Information

Reverting again to the R.M.A. export schedule, this gives in a tabulated form a large amount of valuable information on foreign markets, under the headings of population, number of licences, wavelengths, import duties, wireless goods mostly in demand in the several markets, and so forth.

A study of the latest figures of British exports shows that, compared with the large foreign trade done by American manufacturers, there is plenty of room for expansion. The total value of wireless goods exported from this country for the eleven months ended November 30th was £914,429, of which valves accounted for £228,809, other parts £303,237, and receivers and electric gramophones for only £147,000.

The total value of exports for November alone was a little over £100,000, so that if the figure for December is about the same, as it should be, the grand total for the year will be a little over £1,000,000. This, of course, is not nearly large enough, except perhaps in the case of valves, though even here there is scope for large increase.

The total export of receiving sets from the United States for the first nine months of this year was no less than 302,000, whereas from the United Kingdom it was only 6,209 for the same period. As was only to be expected, this country proved by far the best foreign market for American manufacturers. It is to be hoped that the new anti-dumping orders affecting foreign receiving sets and valves will not only very considerably reduce our imports, but also serve to stimulate our export trade.

Electrical Imports of New Zealand

THE following table shows the values of electrical and allied goods imported into New Zealand in 1930, according to the recently issued official trade returns. The figures for 1929 have been given for purposes of comparison, and notes of increases or decreases added :—

	1929. Thous. £	1930. Thous. £	Inc. or dec. Thous. £
Electric batteries and cells—			
Total	168	168	—
From United Kingdom	42	47	+ 5
„ United States	70	60	— 10
„ Canada	51	51	—
Generators, motors and transformers—			
Total	423	475	+ 52
From United Kingdom	272	339	+ 67
„ United States	99	89	— 10
„ Sweden	20	16	— 4
„ Canada	9	11	+ 2
„ Germany	10	7	— 3
Insulated cable and wire—			
Total	366	367	+ 1
From United Kingdom	341	346	+ 5
„ United States	5	4	— 1
„ Canada	8	2	— 6
Electric lamps (incandescent filament)—			
Total	169	134	— 35
From United Kingdom	118	101	— 17
„ Netherlands	23	16	— 7
„ United States	18	10	— 8
„ Austria	5	2	— 3
Other electric lamps—			
Total	29	30	+ 1
From United Kingdom	6	7	+ 1
„ United States	15	15	—
Cooking appliances—			
Total	70	53	— 17
From Canada	63	50	— 13
„ United Kingdom	7	3	— 4
Carbons in blocks, &c.—			
Total	25	16	— 9
From United Kingdom	17	11	— 6
„ United States	4	4	—
Insulators—			
Total	14	30	+ 16
From United Kingdom	10	15	+ 5
„ United States	3	4	+ 1
Wireless sets in cabinets—			
Total	86	136	+ 50
From United Kingdom	4	6	+ 2
„ Canada	6	10	+ 4
„ Australia	2	1	— 1
„ United States	70	106	+ 36
Telegraph and telephone material—			
Total	305	153*	—
From United Kingdom	89	81	—
„ Canada	3	—	—
„ United States	130	23	—
„ Belgium	54	41	—
„ Netherlands	14	—	—
Other electrical material—			
Total	358	443	+ 85
From United Kingdom	200	250	+ 50
„ United States	81	115	+ 34
„ Australia	23	19	— 4
„ Canada	19	21	+ 2
„ Switzerland	44	53	+ 9
„ Sweden	14	10	— 4
Electricity meters—			
Total	77	71	— 6
From United Kingdom	47	40	— 7
„ Canada	26	29	+ 3
„ United States	2	2	—
Recording and testing instruments and meters—			
Total	76	77	+ 1
From United Kingdom	46	47	+ 1
„ United States	23	21	— 2
„ Germany	3	5	+ 2
Vacuum cleaners—			
Total	68	44	— 24
From Canada	26	20	— 6
„ United Kingdom	7	5	— 2
„ United States	11	19	+ 8
„ Sweden	19	12	— 7

* In addition there was imported in 1930 other apparatus peculiar to wireless telegraphy and telephony to a total value of £172,000, of which £142,000 in value came from the United States.

New Books

Handbook of Industrial Electricity. By MAX KUSHLAN. 24s. net. McGraw-Hill Publishing Co., Ltd., London.

This is a new and compact reference book which covers a very wide field of installation work. It is intended for the operative electrician rather than the technically trained man.

The preliminary general section on "Electricity as a Source of Power" comprises in itself a useful and original first course in electrical engineering. The non-mathematical treatment of alternating current working is skilful and interesting and will be valued by practical readers. The diagrams and drawings of equipment with which the handbook is lavishly provided are clear and well arranged to suit the relative text. Lighting and power installations of all kinds are described in detail and the methods employed in America for industrial, public and domestic plants are adequately discussed.

A novel feature is the segregation of many reference tables into a separate division at the end of the book and a simple system of cross reference symbols which connect the data of the tables with the other sections of the book.

The practice of wiring as described is all in accordance with the American National Code and is supplemented by the recommendations of the National Electric Light Association, and therefore differs in many ways from the practice in this country. The still common use of 110 V for public supply lighting is no doubt responsible for the retention of fibre tube protectors and metal trough conveyors in America. On the other hand, more attention is paid to the fireproof qualities of cable insulation than in Britain. The use of small lead-sheathed wires or wires covered with an ignitible compound only is discouraged. This book in many ways reveals a closer co-operation with the architect than is usual here and some details are given as to spacing of conduits to suit concrete fillings and regarding the design of special fireproof tilings at boxed outlet points. There is a chapter on estimating for electrical work which could be studied with advantage by every contractor, although it is to be noted that the author seems to admit the supreme importance of experience in the accurate computation of projected installation costs.

Elektromagnetische Grundbegriffe: Ihre Entwicklung und Ihre Einfachsten Technischen Anwendungen (The Basic Principles of Electro-magnetism; their Development and Simplest Technical Applications). By W. O. SCHUMANN. Pp. 220; figs. 197. Munich and Berlin: Verlag von R. Oldenbourg. Price Rm. 11.

This book, which comprises mainly a collection of the lectures given by Herr Schumann, is intended for the benefit of young electrical and mechanical engineers in the early period of their instructional career in electro-technical subjects. So far as possible purely theoretical matter has been avoided, the purpose of the author being to combine with each basic principle an idea of its application in actual practice.

Die Elektrischen Maschinen. Band II, Konstruktion und Isolierung. By LIWSCHITZ and GLOCKNER. Pp. 306; 462 illustrations. Leipzig: Teubner. Price Rm. 19 (cloth).

This volume, although a corollary to a previous one on the theory and practice of electrical machines, is in itself a self-contained treatise, intended as a guide to students and junior engineers.

It is divided into two principal sections, one on insulation, and the other on construction.

It is clearly impossible to go into great detail with such a range in the compass of a 300-page volume. As a result, the treatment of some subjects is decidedly superficial. For example, "Air and Oil as Cooling Media" is allowed less than one page.

The range of sizes and types of machines illustrated is wide, and the authors have provided a series of general constructional drawings which will be extremely valuable to young engineers. We suggest, however, that the same class of readers would derive considerable mental stimulus if more consideration were given to explaining the factors which limit the outputs of machines of different classes. Examples of German, Swedish, Swiss, French, and American machines are illustrated, but British practice is, unfortunately, not represented.

There is a good index and an extensive bibliography, and the general production of the volume is excellent.

Die Phasen Kompensation in Drehsstomanlagen: Ein Hilfsbuch für Praktische Leistungsfaktor Verbesserung (Phase Compensation in A.C. Power Plants and the Improvement of Load Factors). By ING. H. RENGERT. Pp. 106; figs. 98. Munich and Berlin: Verlag von R. Oldenbourg. Price Rm. 5.

The author has endeavoured in this book to produce a guide to power plant designers and operating engineers by bringing before their notice the various methods of phase compensation that are available, particularly from the point of view of their economic and technical advantages in load factor improvement. Chapters are included which deal with a.c. exciting machines, compensating and synchronous motors and condensers.

Automotive Repair. By J. C. WRIGHT. Vol. II, for electrical service men. Second edition. Pp. xiii+312; figs. 164. London: Chapman & Hall, Ltd. Price 18s.

The modern petrol motor vehicle would not be practicable but for the accompanying electrical equipment, which performs three vital functions, *viz.*, the starting of the engine, the provision of the electrical ignition and the illumination of the vehicle at night. An electrical department has, therefore, become a necessary section of all motor-vehicle service stations.

When such a relatively costly technical book as this runs into a second edition, it may safely be taken that it has met a want. It really consists of two books in one; the first, which runs to 157 pages, is the result of a study of the principal repair jobs which find their way to the average electrical service shop; these have been reduced to about forty different causes of failure, the method of dealing with which is very clearly dealt with, the text being amplified by useful accompanying sketches or other illustrations. The instructions cover each and every component of a motor vehicle's electrical equipment.

Part II of the book, of approximately the same length, is devoted to a clear outline of the theory of electricity so far as it is necessary to provide electrical service station men with a thorough understanding of the various electrical units of motor vehicles. This section is also well illustrated, there being altogether over 160 line drawings and half-tone pictures. A useful feature of the book—which concludes with a copious index—is the questions that are printed at the end of each sub- or main chapter. The book is one that can be recommended, and owners of electrical service stations should bring it to the notice of their employés.

* * *

Shorter Notices

"Communications of the Electric Heating Research Institute of the Hanover Technical High School—No. 6." Pp. 27. Berlin: Schubert & Co., Verlag. Price Rm. 2.60.—The latest report, which is of course printed in German, has been prepared by Dipl.-Ing. C. F. Volker and deals with the work which has been carried out at the Institute in connection with the determination of the heat-conducting temperature of enclosed electric cooking plates.

The handbooks of the Science Museum, South Kensington, have been added to by the issue of "Land Transport"—III, dealing with railway locomotives and rolling stock. Part I (price 2s. 6d. net) is a historical review and bibliography; it includes sections on colliery locomotives, electric locomotives, and tramways. Part II (price 2s. net) is a descriptive catalogue. Both are excellently compiled and liberally illustrated.

"Overhead Costs," by Sir Henry Bunbury. Pp. 86. London: Sir Isaac Pitman & Sons, Ltd. Price 2s. 6d.

Indian Electrical Notes

Electrical Imports

THE imports of electrical machinery into India during the half-year from April to September of last year showed a decline as compared with those of the corresponding period of 1930. Control and switchgear fell from Rs.20 lakhs to Rs.16 lakhs, motors from Rs.21 lakhs to Rs.16 lakhs, generators from 23 lakhs to 21 lakhs, and transformers from 9 lakhs to 5 lakhs. Imports under the heading "Miscellaneous," however, rose from Rs.36 lakhs to Rs.46 lakhs. The share of the United Kingdom declined from Rs.90 lakhs to Rs.70 lakhs, and the share of Germany from Rs.10 lakhs to Rs.7 lakhs, but the share of the United States increased from Rs.7 to Rs.24 lakhs.

The imports of electrical instruments and apparatus also fell from Rs.156 lakhs to Rs.126 lakhs. The decline seems to be due to restricted programmes of development everywhere in India owing to depression. Imports of electric wires and cables fell from Rs.54 lakhs to Rs.36 lakhs, the share of the United Kingdom decreasing from Rs.46 lakhs to Rs.23 lakhs. In the total imports of electrical goods, the United Kingdom's share fell from Rs.89 lakhs to Rs.63 lakhs, while that of the United States fell from Rs.21 lakhs to 16 lakhs. Germany's quota remained practically unchanged, the total again amounting to about Rs.20 lakhs.

Broadcasting Prospects

Under instructions from the Government of India, the broadcasting stations at Bombay and Calcutta, which were to be closed from November 30th in pursuance of the policy of retrenchment, are to be continued for some time. At the same time, two proposals are under consideration for handing over the business to private concerns. One proposal is that the Marconi International Marine Co. should take over the control of the Calcutta station. Merchants in Calcutta and in Bombay are agreeable to this proposal, but it seems that the Government of India desires that an Indian concern should take over the stations. The other proposal is from Mr. Abdulla Fazalbhoy, a prominent radio merchant of Bombay, who proposes to form a syndicate to take over the Calcutta and Bombay stations. The Radio Merchants' Association, Bombay, favours an international concern taking over the control of broadcasting.

Business and Industrial Notes

The Week's Electrical Trade News from all Sources. Commercial and Industrial Developments, Business Changes, Market Prices for Materials, Trade Openings, New Publicity Literature, Liquidations, and Failures

The "Electrical Review" Index

The Index to Vol. CIX (for the half-year ended December 31st, 1931) is in course of preparation and will be published shortly. We shall be glad to receive the names and addresses of those who require it (free of charge) for binding purposes, or wish to retain it for reference. Application should be made as early as possible to the Publisher, 4, Ludgate Hill, E.C.4.

Recent Contracts

In connection with the extension to the electricity generating station at Barking, the County of London Electric Supply Co., Ltd., has recently placed a large order for transformers with the Hackbridge Electric Construction Co., Ltd. A number of station transformers up to 10,000-kVA capacity, are included in the contract, but the main item of interest is a set of two 93,750-kVA, three-phase, 50-cycle, 12,500/33,000-V transformers. This is the B.S.S. rating, the continuous output permissible at an air temperature of 30 deg. C. being 103,125 kVA.

The D.P. Battery Co., Ltd., is supplying the batteries for the new trolley-buses at Derby. Each vehicle is fitted with a 12-V 65-Ah "Kathanode" battery type B.K. 65, which operates the electric horn, the windscreen wiper, and, in addition, supplies the auxiliary lighting through a contactor switch whenever the trollies are removed or in the event of the supply failing. The latest omnibuses of the Derby Corporation are also fitted with "Kathanode" batteries.

The Dublin Port and Docks Board has placed further contracts with Siemens Electric Lamps and Supplies, Ltd., for twelve months' supplies of lamps and electric lighting fittings.

The General Electric Co., Ltd., announces that it has received contracts from the following steamship companies for the supply of "Osram" lamps:—T. & J. Harrison (Harrison Line); Bibby Line; T. & J. Brocklebank; Booth Steamship Co., Ltd. A contract has also been received from the Admiralty for 91,800 pearl "Osram" lamps.

Sir W. G. Armstrong Whitworth & Co. (Engineers), Ltd., have received an order from the Gaekwar's Baroda State Railway for four Diesel-electric rail-cars for 2 ft. 6 in. gauge. The rail-cars are each intended to haul two trailers. Production will start immediately at the company's Scotswood works. The bodies of the rail-cars are to be built in India to the Railway's own requirements.

Birmingham Electric Furnaces, Ltd., has received an order for 37 electric heat treatment furnaces of various types, for export to Russia.

The Hart Accumulator Co., Ltd., has recently delivered and erected a battery consisting of 123 cells having capacity of 1,000 Ah, to provide for emergency lighting at the new Broadcasting House, London.

Economic Conditions in Canada

A *Reuter* message from Ottawa states that the close of an industrially clouded year finds Canada still suffering from the effects of the world industrial crisis, although the situation in the Dominion is not so serious as in most other countries. There are, however, favourable features in the economic condition of the country. Among these are the soundness of the financial position, as shown by statements of the leading banks and the establishment of a favourable balance of international trade in recent months. The prospects of preferential treatment in British markets as a result of the Imperial Conference next summer and the prospective benefits from a wheat quota in Great Britain are promising signs for the future. Five branches of industry in Canada—agriculture, forestry, mining, electricity, and fishing—have all felt the ill effects during the past year of the world-wide economic troubles. The hydro-electric industry, however, shows a substantial development, there having been an increase of approximately 500,000 h.p. in installations during the year, bringing the total plant installed to over 6,600,000 h.p., or about 15 per cent. of the potential water-power resources of the country.

Social Events

The Rifle Section of the Shoreditch Electric Sports Club, which is run by the employés of the Borough Council's Electricity Department, held its annual Christmas shoot on December 19th at the Whiston Street generating station range. Competitions have been running for several weeks, and the finals of these were shot, and the closeness of the shooting was enthusiastically applauded by a record attendance. The match between the Whiston Street and Coronet Street generating stations, captained respectively by Mr. P. C. Ebner and Mr. S. H. Thomas, was this year won by the Whiston Street station. Refreshments were served after the shoot, and the prizes were presented by Councillor Baker, the chairman of the Electricity Committee.

The annual Christmas parties given by Mr. and Mrs. Marryat to the employés of Marryat & Place were held at the Holborn Hall on December 19th. In the afternoon 265 children were entertained to tea with clowns and conjuring, while nearly 500 of the firm's people with their wives and sweethearts were present at the concert and dance in the evening. Mrs. Marryat was unable to attend, but Miss Mary Marryat, who is not yet sixteen, made a little impromptu speech upon her behalf. Mr. Harry Heap was responsible for the concert and the dance band, and the soloists were Miss Mary Winter, Mr. Reginald Johnson and Mr. Ben Lawes.

On December 5th the employés of Messrs. T. Clarke & Co., Ltd., held their eighth annual dinner at the Hotel Great Central, Marylebone. With Mr. E. J. Clarke, the principal, in the chair, the function was well attended by the employés and their guests. Toasts drunk during the evening included those to Mr. Clarke, proposed by one of his foremen, and to "The Firm," proposed by a visitor, both of which were received with enthusiasm. In each case the speakers drew attention to the excellent spirit of comradeship and co-operation which existed between all those connected with the firm. A concert provided by well-known artistes entertained the company during the evening.

The annual staff dance of the British Vacuum Cleaner and Engineering Co., Ltd., was held on December 21st at Fulham Town Hall, about 500 members and friends being present. Dancing commenced at 7.30 p.m., and except for two short intervals for addresses by Mr. H. C. Booth (chairman and managing director) and Mr. J. J. Hambridge (general manager), and for refreshments, was continued until 11.30 p.m.

The Rialto Cinema, Blackburn

The new Rialto Super Cinema at Blackburn was recently formally opened by the Mayor. The electrical equipment of this theatre, both as regards lighting and controls, marks a decided step forward in provincial colour-lighting practice for cinemas. Holophane reflectors, troughs, and "Hedralite" fittings are the media for the colour-lighting scheme, the operation being by push-button control throughout. Approximately 22,000 yds. of Johnson & Phillips' v.i.r. and armoured cable has been employed for the wiring installation, while the Exide "Keepalite" system of emergency lighting has been installed for the exit and passage lights. The ironclad switchgear was supplied by the Midland Electric Manufacturing Co., Ltd., and the conduits by Walsall Conduits, Ltd. The complete wiring installation throughout the theatre, the equipping of the projection room, generating room, switch-room and stage machinery, together with the wiring of the organ lift, was carried out by Messrs. Fryer & Hartley, Ltd.

New B.I. Branches

In pursuance of a vigorous sales campaign and to improve the company's service, British Insulated Cables, Ltd., have opened new offices and stores at the following addresses, where large stocks of cables and wires will be held:—

Brighton, 41a, North St. (manager, Mr. J. E. Landstone; telephone 2597). Gloucester, 25, St. Aldate St. (manager, Mr. J. W. Green; telephone 3561). Nottingham, 2, Commerce Sq. (manager, Mr. M. H. Healey; telephone 43166). Sheffield, 72, Shoreham St. (manager, Mr. T. W. Anns; telephone 24251). Southampton, 70, High St. (manager, Mr. C. D. Wetton; telephone 2701).

Mr. F. Samuel has taken Mr. Anns's place at Ipswich.

The South African Domestic Appliance Market

Although business in most lines is very much on the low side, the Johannesburg *Star* reports that many firms handling domestic electrical appliances are obtaining satisfactory results. Business in electric stoves is said to be steady and the demand increasing, this being attributable to the hire-purchase facilities now offered by the municipality. Another electrical appliance which is selling fairly well at present is the domestic refrigerator.—*Reuter's Trade Service* (Johannesburg).

British Electrical Goods in Spain

At a recent meeting in Madrid of the Council of the British Chamber of Commerce for Spain, correspondence was read between the chamber and the British Electrical Development Association and the Federation of British Industries regarding the absence of British electrical material in Spain. In this connection it is interesting to learn that a movement is on foot with the object of creating a permanent showroom in Madrid for the display of samples of British goods, catalogues, etc.

Consulting Business Changes Hands

Messrs. Henry Lea & Son inform us that they have purchased the practice of the late Mr. Moffett, trading as Moffett Rosher & Mann, consulting engineers, Union Chambers, Birmingham, and will deal with all the work involved from their own office at 151, Edmund St., Birmingham.

Exhibition at Barnes

An electrical exhibition and fair is to be held from January 4th to 30th at the Barnes Green School, Barnes. There will be demonstrations by the Electricity Department of the Urban District Council of domestic appliances, and cookery lectures. Local traders will be represented at the stalls.

Lighting of C.W.S. Building at Newcastle

A novel lighting scheme has been decided upon for the Co-operative Wholesale Society's new building at Newcastle-upon-Tyne. The whole of the equipment required is being designed and made under the direction of Mr. L. G. Ekins, the architect, by Messrs. Falk Stadelmann & Co., Ltd.

Bulgarian Import Duties

The Bulgarian Government has imposed import duties ranging from 8 to 25 per cent. *ad valorem* on all imported merchandise formerly free of duty. These include a duty of 10 per cent. *ad valorem* on copper wire cable.

Polish Electrical Imports

According to the *Board of Trade Journal* the value of imports of conductors, apparatus, and other electrical materials into Poland during October last amounted to 4,790,000 zloty.

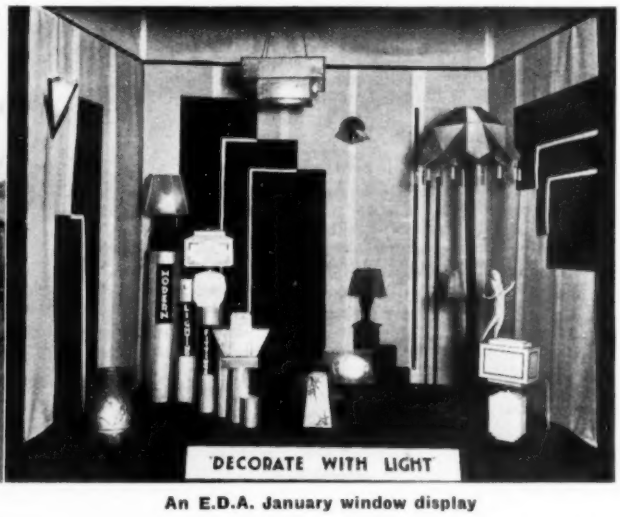
New Indian Companies

Among the new concerns recently formed in India are the Sylet Electric Supply Co., Sylet, Assam, with a capital of 5,00,000 rupees, and S. D. Marker & Co., electrical engineers, Ismael Buildings, Hornby Road, Fort, Bombay (1,25,000 rupees).

The E.D.A. January Programme

For the benefit of those who are not *au fait* with its publicity service facilities, the British Electrical Development Association gives particulars of its special local advertising schemes in its January programme, which also contains two examples of advertisements for local papers. The two suggested window displays for the month relate to home illumination and lighting and domestic appliances. The former is shown in one of the accompanying illustrations, and it will be seen that it embodies a good selection of fittings. With the aid of window dressing

The new E.D.A. poster on a London hoarding



An E.D.A. January window display

material, obtainable from the Association, a simple but effective display can be arranged. The literature and the posters for the month are devoted to electric lighting. Special attention is drawn to the new 16-sheet poster which the Association has produced, particulars of which were given in our issue of December 18th, p. 927. Our other illustration demonstrates its effectiveness when placed on a hoarding with other posters. The notes contributed by the director deal with the membership of the Association, and show its growth during the past year. A list of sales conferences during the month is given; the next conference in London is to be held at the City of London Electric Restaurant, Ludgate Hill, E.C., on January 15th, when Mr. A. G. Clausen will speak on "What every Electrical Salesman and Saleswoman should know about Electrical Refrigeration."

Irish Free State Electrical Imports

A very quiet tone continues to exist in the electrical trade in the Irish Free State, the imports of machinery and cognate apparatus during October last amounting to a value of £65,587, bringing the total for the first ten months of the year to £548,786, a decrease of £208,275, or over 27½ per cent. as compared with the corresponding period of 1930. Details of the ten months imports are appended :—

	Jan. to Oct. 1931.	Jan. to Oct. 1930.
	£	£
Electrical machinery	155,553	253,262
Electric wires and cables	78,266	138,539
Electric lamps and parts	49,437	75,051
Radio sets and parts	87,877	76,907
Other electrical goods	161,975	173,805
Copper wires	15,678	39,677
Total	£548,786	£757,241

It will be noticed that radio material constitutes the only item showing an increase.

Italian Electrical Imports

A return just to hand shows that the imports of electrical machinery, apparatus, and supplies into Italy during the nine months ended with September last, attained a value of £2,010,720, as compared with £2,777,630 in the corresponding nine months of 1930. The exports of similar material from Italy during the same period increased from £668,100 to £730,150.

Headquarters for Dumfries Undertaking

Dumfries Town Council has decided to purchase the estate of Marchmont, near Dumfries, for the sum of £6,600 to be used as headquarters for the new electricity undertaking.

Foreign Exchange Restrictions

A memorandum setting out the restrictions placed on foreign exchange transactions by the various governments has been prepared by the Department of Overseas Trade. British firms wishing to obtain a copy should apply to the Department, 35, Old Queen Street, S.W., quoting reference No. C. 3766.

An Income-tax Payment Scheme

At the request of the Battersea Borough Electricity Committee the Finance Committee recommends that a scheme should be formulated for advancing the amount of income tax payable by employés and making weekly deductions from their wages during the first four months of the year.

New Year Holidays

The works and offices of Messrs. Parmiter, Hope & Sugden, Ltd., will be closed to-day (January 1st) and to-morrow.

Quick Work

At 11 o'clock on December 19th, the Yorkshire Electric Power Co. received a telephone message to the effect that a steam engine at the works of Messrs. Eastwood Bros., woollen manufacturers, Honley, had broken down and was seriously damaged. As the mill was exceptionally busy the company was appealed to for an endeavour to provide an electric drive for the machinery by the following Monday morning. Arrangements were immediately put in hand and before 10 o'clock on Sunday evening a supply was available to the mill. The Power Company also undertook the consumer's installation, comprising some 90 h.p., and all the wiring.

Trade Announcements

As a consequence of a recent fire at their premises, Floral Street, Covent Garden, Messrs. Mansell & Ogan, Ltd., have had to open temporary premises at 33-35, Endell Street, W.C.2.

Messrs. V. H. Bennett & Co., electrical and wireless engineers, have opened new showroom premises at 8-9, Bond Street, Weymouth.

For Sale

Edinburgh Electricity Department has some transformers for disposal.

Sunderland Corporation invites offers for the purchase of electrical plant and apparatus.

(See our advertisement pages to-day.)

Prices of Materials

Messrs. F. Smith & Co. report, December 30th : No change in the prices of silicium bronze and electrolytic copper h.c. wires.

Messrs. Edward Till & Co. report, December 30th : India-rubber, Para fine, no change.

Messrs. James & Shakespeare report, December 30th : Copper bars (best selected), sheet and rod, £77, £2 inc. English pig lead, £17, 5s. inc.

German-Swiss Tariff Agreement

The *Board of Trade Journal* reports that as a result of a German-Swiss agreement, a reduced "conventional" duty of 25 Rm. per 100 kg. has been introduced in the German customs tariff for oil coolers for steam turbines or transformers, if imported separately.

The E.W.F. Dinner

The annual dinner of the Electrical Wholesalers' Federation will be held on February 18th, at the Savoy Hotel, Strand, W.C., at 6.30 for 7 p.m.

Catalogues Required

Messrs. C. Bedford & Sons, Ltd., 336, Gray's Inn Road, King's Cross, W.C.1, wholesale electrical factors and manufacturers, are asking for manufacturers' catalogues and lists.

Wages in the Cable-making Industry

The Joint Industrial Council for the Electrical Cable-Making Industry informs us that the December 1st cost-of-living index figure is 48 per cent. above the 1914 level, and that therefore there will be no alteration in wages in the industry on the third pay-day in January.

Inquiry for Dry Battery Components

The Department of Overseas Trade has received an inquiry from Sweden for the names of manufacturers of zinc cups, small brass terminals and connections, and cardboard boxes for small dry cell batteries. United Kingdom manufacturers can obtain full details on application to the Department, 35, Old Queen Street, S.W.1.

The Swedish Electrical Market

According to the *Swedish Economic Review*, exports of electrical machinery during the period January-October, 1931, amounted to 19,368,000 kr. in value, a decrease of 9,923,000 kr. as compared with the corresponding period of 1930. Telegraph and telephone apparatus exports, however, rose slightly, from 12,434,000 kr. to 12,605,000. Within the ore-mining and metal industries the electro-mechanical industry still occupies the most favourable position, but has experienced a decline in orders.

Dundee Buys British Cable

The Dundee Corporation Electricity Committee at its meeting on December 21st accepted tenders for cables. The total figure for foreign cable was £2,690, against the British manufacturers' total of £3,020, but in the foreign offers import duties were not included. The percentage difference in favour of the foreign offers was 12 per cent. It was claimed that the difference would be made up by unemployment benefit to British workmen, and the Committee decided unanimously on the British-made cable.

A Five-day Week

Messrs. W. Sisson & Co., Ltd., of Gloucester, have decided, as from December 28th, to contract the working of the establishment to five days per week. The offices and works will, in future, and until further notice, be closed on Saturday and Sunday.

Hart Accumulator Works Visit

A party of naval officers, at present undertaking a course of instruction in electricity on H.M.S. *Vernon*, stationed at Portsmouth, recently visited the Stratford Works of the Hart Accumulator Co., Ltd., where they were afforded an opportunity of inspecting the various processes of accumulator manufacture.

Calendars and Diaries

A pretty girl—not to speak of a brilliant electric fire—graces the calendar of the Carron Company, and there are quotations from the works of popular writers on the daily slips.

"A Thing of Beauty" is the apt title of the calendar of Messrs. Fitter & Poulton, Ltd.

A reproduction of "The Double Thrill," a striking painting by Philip Goodwin, illustrates the 1932 calendar of Messrs. Norvall Bros.

The daily sheets of Messrs. T. J. Grainger & Co.'s calendar are in exceptionally bold type.

We have received from the Westminster Tool and Electric Co., Ltd., an electro-plated paper knife.

The daily slips of the neat little calendar of the West Gloucestershire Power Co., Ltd., bear Shakespearean quotations.

Messrs. Lindsay & Williams have again sent us one of their well-known wall calendars with large-sized daily slips.

"Heirlooms" is the title of the excellent picture on the calendar of Messrs. Ernest F. Moy, Ltd.

In addition to its useful well-made calendar-blotter the Hart Accumulator Co., Ltd., is issuing a wall calendar illustrated with a virile picture of the Port of London.

Views of its works and some of its products are contained on the monthly sheets of the 1932 calendar of the British Jeffrey-Diamond, Ltd.

Messrs. Lionel Robinson & Co. have taken a drawing of some of the old buildings at Staple Inn, London, as the subject of their attractive calendar.

A set of roller-bearing letter clips and a newspaper clip have been sent us by Messrs. Herbert Terry & Sons, Ltd.

The diary received from Messrs. Thomas Bolton & Sons, Ltd., is neatly bound in dark-red leather and contains a good deal of information regarding copper weights, wire gauges, &c.

A wall calendar mounted on stout cardboard has been sent us by the Enfield Cable Works, Ltd. The monthly sheets are in easily readable type and contain small calendars of the preceding and following months.

A daily indicator device is provided for the monthly sheets of Messrs. Francis Polden & Co.'s calendar. The diary of this company is nicely bound in red imitation leather, and is self-opening.

Illustrations of the company's products and works are shown on the calendar of Messrs. Greenwood & Batley, Ltd.

Dexine, Ltd., send us a large-sized wall calendar illustrating various uses of "Dexonite" insulating materials.

The Goddess of Electricity banishing the demons, "Worry," "Dirt," and "Waste," is the subject of a striking telephone card sent us by the County of London Electric Supply Co., Ltd.

In our last issue we mentioned a calendar received from "Messrs. Christopher Wade." This should have read "Mr. Christopher Wade, of Messrs. Gabriel, Wade & English, Ltd."

A modern young lady driving a car is the subject of an attractive calendar received from Messrs. Haslam & Stretton, Ltd.

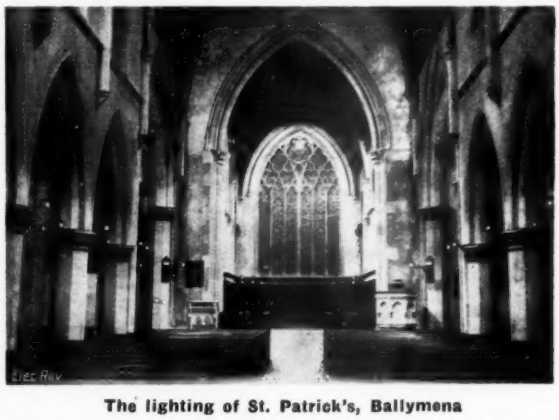
Views in sepia of well-known towns, buildings and beauty spots all over the world illustrate the calendar of Messrs. C. A. Parsons & Co., Ltd.

A handy little book of graph paper with a calendar at the end is being issued by the Power Plant Co., Ltd.

Clearly printed daily slips are contained on the calendar of the Supra Electrical Co., Ltd.

An Ediswan Lighting Installation

The accompanying illustration shows the interior of St. Patrick's Church of Ireland, Ballymena, the lighting of which has recently been changed over from gas to electricity. The electrical installation was carried out by means of Ediswan "Floodray" projectors, fitted in the roof structure at a height



The lighting of St. Patrick's, Ballymena

of about 35 ft. above the floor level. The scheme was carried out by Messrs. John Dowling & Sons, Ltd., of Belfast, and was planned in collaboration with Mr. W. Adair, consulting engineer, and the Illuminating Engineering Department of the Edison Swan Electric Co., Ltd.

Stewart & Lloyds and Income Tax

Messrs. Stewarts & Lloyds have prepared a scheme for assisting their employés to meet income-tax payments. The company has arranged to pay over to the Inland Revenue authorities the amount of tax for such of their staff as desire to avail themselves of the scheme. Repayment will be made by means of monthly instalments.

Post Office Inquiry Demand

A memorial signed by over 300 Members of Parliament has been sent to the Prime Minister asking the Government to appoint a committee to review the whole question of the organisation of the General Post Office and to frame detailed proposals for its improvement in the light of the experience and circumstances of the present day.

New Catalogues and Lists

General Electric Co., Ltd., Magnet House, Kingsway, W.C.2.—A publication entitled "Modern Baking," in which the more recent installations of "Magnet" ovens are illustrated. Also an automobile bulb window display cut-out.

Watson & Sons (Electro-Medical), Ltd., 43-47, Parker Street, Kingsway, W.C.2.—An illustrated booklet on surgical diathermy containing details of "Chirotherm" apparatus.

Ever Ready Co. (Great Britain), Ltd., Hercules Place, Holloway, N.7.—A list showing the appropriate h.t. batteries and unspillable accumulators for various standard makes of radio receivers. Also window bills relating to torches and radio batteries.

Electric Fires, Ltd., Heatrae Works, Norwich.—A catalogue illustrating and describing the complete range of "Heatrae" electric water heaters.

Mains Power Radio Co., Broadway Works, Eastern Road, Romford.—Descriptive leaflets dealing with battery eliminators and components for radio receivers.

Morse Chain Co., Ltd., Letchworth.—An illustrated leaflet relating to a new development in "Morse" flexible couplings.

Carron Company, Carron, Falkirk.—Publication K.1, illustrating the company's latest type of electric kettle.

J. H. Tucker & Co., Ltd., King's Road, Tyseley, Birmingham.—A trade price list of ceiling roses and tumbler switches.

Beeantee Illuminations, Ltd., 70, Banner Street, Bunhill Row, E.C.1.—A folder giving particulars of floodlighting equipment.

Electrical Equipment & Carbon Co., Ltd., 107-111, New Oxford Street, W.C.1.—A pamphlet giving details of a new "Crosby" type wire rope clip.

Bruce Peebles Co., Ltd., Edinburgh.—Leaflet No. 161A, dealing with synchronous induction motors for power-factor improvement and power application.

G. & J. Weir, Ltd., Cathcart, Glasgow.—Publication No. 35, giving a brief survey of the more important factors to be considered concerning feed pumps in planning the feed system of a modern power station.

Callender's Cable & Construction Co., Ltd., Hamilton House, Victoria Embankment, E.C.4.—Pamphlet No. 117 dealing with tandem pole type dividing boxes. Illustrated and priced.

Bankruptcy Proceedings

C. M. Karsa, electrical equipment representative, &c., 4, Alder Avenue, Alder Green Estate, High Lane, near Stockport.—This debtor attended at the Court House, Vernon Street, Stockport, on December 18th, for his public examination. His statement of affairs showed liabilities of £1,636, and no assets. Debtor said that the business had been carried on by various members of his family, and on his father's death he received an interest worth £3,000. The nature of the business was importing and exporting goods to and from Egypt and Turkey, and when, during the War, the port of Smyrna was destroyed, the entire family fortune of £510,000 disappeared. Debtor added that he had been interested in three businesses in Manchester, two concerning merchant shipping, the other being a hardware agency. The examination was closed.

J. L. Goldsman, radio engineer, 100, High Holborn, and lately of 4, Great Queen Street, Kingsway, W.C.—An application was made on December 17th to Mr. Registrar Warmington at the London Bankruptcy Court for an order of discharge on behalf of this bankrupt, who failed in January, 1930. According to the Official Receiver's report the provable debts amounted to £1,761; while the assets, valued at £429, realised £174, and a dividend of 3½d. in the £ has been declared by Mr. W. A. J. Osborne, the trustee. The debtor's insolvency was attributed to lack of capital, depression in trade, and loss sustained in perfecting and manufacturing wireless sets and radio gramophones. The application was opposed by the Official Receiver on statutory grounds, and the discharge was suspended for six months.

S. Schorah, journeyman electrician, 12, Saint Gabriel's Avenue, Brownhill, Blackburn, Lancs.—This debtor appeared at the County Court House, Victoria Street, Blackburn, on December 16th for his public examination. He had prepared a statement of affairs which showed a deficiency of £155. He said that his failure was due to costs awarded against him in a legal action. In 1929 he sued a 'bus company for damages as a result of a collision between one of its 'buses and his motor-cycle, but the case went against him. The examination was closed.

H. Moses (known as Maurice Haar and lately trading as the "Fleet Electric Service"), electrical engineer, late of 26, Ivy Lane, Newgate Street, E.C.—The statutory first meeting of creditors under a receiving order made recently was held last week in Bankruptcy Buildings, Carey Street. The liabilities are estimated at £434 and the assets are understood to be nil. He attributes his insolvency to bad trade and to heavy overhead expenses. As a result of the meeting, which was closed, the affairs of the debtor remained in the hands of the Official Receiver.

W. R. Blakeway (Pearson & Co.), electrical contractor, 31, High Street, Southampton.—Receiving order made December 19th, on debtor's own petition. First meeting, January 5th, at the Official Receiver's office, Midland Bank Chambers, High Street, Southampton. Public examination, January 20th, at the Court House, Castle Square, Southampton.

C. C. Lewis, wireless engineer, &c., 27, Stanley Gardens, Paignton.—First meeting, December 31st, at the Official Receiver's offices, Exeter Bank Chambers, Broadgate, Exeter. Public examination, January 28th, at the Castle, Exeter.

A. Parker, electrical engineer, 93, Newsome Road, Huddersfield.—Receiving order made, December 21st, on debtor's own petition. First meeting, January 6th, at the Official Receiver's office, 12, Duke Street, Bradford. Public examination, February 10th, at the County Court House, Queen Street, Huddersfield.

J. E. Mather, electrician, &c., 89, Gidlow Lane, Wigan.—First meeting, January 5th, at the offices of the Official Receiver, Government Buildings, Victoria Street, Liverpool. Public examination, January 28th, at the Court House, Crawford Street, Wigan.

T. Sharpe, electrical contractor, 62, Oldham Road, Springhead.—First meeting, January 5th, at the Official Receiver's offices, Byrom Street, Manchester. Public examination, February 16th, at the Court House, Church Lane, Oldham.

F. M. Crane, electrician, 11, Kirkley Road, Merton Park.—First and final dividend of 1s. 10d. in the £, payable December 30th, at the Official Receiver's offices, 29, Russell Square, W.C.

E. Marsden, electrical engineer, 51, High Holm Road, Louth, Lincs.—Receiving order made, December 23rd, on debtor's own petition.

T. Sharpe, electrical contractor, 62, Oldham Road, Springhead.—Receiving order made, December 22nd, on a creditor's petition.

W. J. Lattimer, electrical engineer, 1, St. James Park, Croydon.—Discharge suspended for six months until May 19th.

Company Liquidations

Halycon Wireless Co., Ltd.—First meetings, January 1st, at Bankruptcy Buildings, Carey Street, W.C.

B.H.M., Ltd.—Winding up voluntarily. Liquidator, Mr. T. E. Reynolds, 2 & 3, The Sanctuary, Westminster, S.W. Particulars of claims by January 8th to the liquidator.

Auto-Electric Devices, Ltd.—Winding up voluntarily. Liquidator, Mr. A. Jolly, 103, Church Road, Hove. Particulars of claims by January 30th to the liquidator.

Henry Jackson & Co., Ltd.—Particulars of claims by January 22nd to the liquidator, Mr. F. S. Salaman, 1 & 2, Bucklersbury, E.C.

Wadabridge and District Electric Supply Co., Ltd.—Particulars of claims by January 9th to the liquidator, Mr. H. Fraser, 4, Fenchurch Avenue, E.C.

Mold Accumulators, Ltd.—Particulars of claims by January 10th to the liquidator, Mr. J. Davies, 1, Bank Street, Wrexham.

Jones Bros. (Streatham), Ltd.—Meetings, February 1st, at 36 and 37, Queen Street, E.C., to receive an account of the winding-up by the liquidator.

Winding-up Petition

Bury Lighting & Heating Co., Ltd.—An application for the winding-up of this company has been presented to the County Court of Lancashire by Mr. L. Myers and will be heard at the Court House, Mawdsley Street, Bolton, on January 20th.

Electricity Supply

Lighting, Domestic, Power

Alresford (Hants).—THE FUTURE SUPPLY.—The Rural District Council has received communications regarding the proposed transfer of the powers granted to the West Hampshire Electricity Co., Ltd., to the Mid Southern District Utility Co. It was pointed out that, now the latter had purchased the Alton electricity undertaking and was developing supplies in that area, the company was in a far more advantageous position to supply electricity in the Alresford district. It was stated that the charges would be 8d. per kWh for lighting, and 1½d. for power. The matter is to be fully discussed at the next meeting of the Council.

Aylesbury.—LOAN SANCTIONED.—The Town Council has received sanction to loans of £7,881 for mains, £1,518 for substation and equipment, and £335 for changing over consumers' apparatus.

Barrow-in-Furness.—LOAN SANCTIONED.—The Electricity Committee has obtained sanction to a loan of £4,333 for h.p. lines in connection with the supply to Cartmel, Beckside, Newby Bridge, Haverthwaite and Lakeside.

Birmingham.—PROGRESS DURING NOVEMBER.—The number of new consumers connected to the Electricity Department's system during November was 1,650, making a total of upwards of 24,000 additional consumers connected during the past twelve months—a record in the history of the undertaking. A new record was also established recently, when a day's output from the power stations was well over two million kWh, an increase of 8½ per cent. over the record made in December, 1930. The assisted-wiring scheme is also developing satisfactorily, the total number of installations carried out under the scheme being now approximately 9,000. There was an increase in the sales of electricity for industrial purposes, though this to a large extent is due to new business secured recently.

Blackpool.—THE AUTUMN ILLUMINATIONS.—A suggestion to extend the autumn illuminations next year to embrace the new £250,000 South Shore Promenade is being considered. This year's illuminations cost less than expected, the actual expenditure being £158 below the £12,000 estimated.

Brentford.—MAINS EXTENSIONS.—The Brentford Electric Supply Co., Ltd., is to lay mains in Brook Lane, Half Acre, Albany Road, and Brock Road.

Brighton.—NEW CABLES.—The Electricity Committee is to lay additional cables to the South Moulscombe Estate at a cost of £3,220 in order to make it possible to remove the regulation prohibiting the use of electricity for heating and cooking on this estate.

LOANS SANCTIONED.—Sanction has been received to loans of £3,000 for the extension of a ring main from Rottingdean to Telscombe village, and £1,420 for overhead lines to the village of Ovingdean.

ELECTRICITY PREFERRED.—At a recent meeting of the Housing Committee the borough engineer reported that the cost of wiring houses on the Tarner Estate for heating and cooking by electricity would amount to £8 15s. per house, as against £8 12s. for the original proposal for a gas supply and a gas copper. The Committee agreed to the additional expenditure.

Burnley.—WAYLEAVE INQUIRY.—Colonel Tucker, of the Ministry of Transport, held an inquiry at Burnley on December 22nd into the Central Electricity Board's application for wayleaves. Mr. O. A. Sherrard said that of 73 wayleaves in the district 59 were obtained by voluntary consent. Eight were now required for the Burnley-Padiham line, and six for the Accrington-Burnley-Padiham line. A representative of the owners of the estate contended that the area would be spoiled by the proposed situation of certain transmission line towers.

Bury.—YEAR'S WORKING.—We have received from Mr. J. G. Potts, borough electrical engineer and manager, a copy of his annual report together with a statement of accounts of the electricity undertaking for the year ended March 31st last. The total revenue amounted to £120,644, as compared with £128,187 in the preceding year, while the working expenditure declined from £77,327 to £67,222. There was a net profit of £1,758, a decline of £3,333 as compared with 1929-30, due mainly to increased sinking fund contributions. Capital expenditure during the year amounted to £17,256, bringing the total invested in the undertaking to £742,467. With the exception of lighting and tramway supplies, sales of electrical energy showed an all-round decrease, the total falling from 29,634,287 to 26,030,432 kWh; the maximum load also, at 10,860 kW, was 1,580 kW lower. There were, however, 553 new consumers connected, bringing the total to 25,507. A scheme of assisted wiring for domestic consumers was inaugurated in November, 1930, but the response so far has not been satisfactory. There are signs, however, that an increasing number of applications can be looked forward to in the near future.

Cockfield (Durham).—STREET LIGHTING SCHEME.—Work has begun on the Parish Council's electric lighting scheme for the village. The contract, which will occupy about three months, is being carried out by Messrs. Reid, Ferens & Co., Newcastle-on-Tyne.

Continental.—GERMANY.—A return just to hand shows that the output of the 122 principal electric supply undertakings

in Germany during September last amounted to 1,147,900,000 kWh, bringing the total for the first nine months of the year to 10,571,400,000 kWh, as compared with 11,988,700,000 kWh in the corresponding period of 1930.

SWITZERLAND.—A syndicate of Swiss and German concerns, in conjunction with the municipal authorities of Winterthur, has applied for a concession to establish an additional hydro-electric power station on the River Rhine, near Rheinau.

Dartford.—YEAR'S WORKING.—The Electricity Committee reports a net profit of £11,045 on the electricity undertaking for the past financial year. Out of this sum £6,950 has been expended on works of a capital nature.

MAINS EXTENSIONS.—Mains extensions are to be carried out in Watling Street at a cost of £400.

East Ham.—CHANGE-OVER.—The Electricity Committee is to change over the supply to the municipal buildings from d.c. to a.c. at a cost of £2,226.

Eccles.—YEAR'S WORKING.—In his report on the operation of the Corporation electricity undertaking for the year ended March 31st last, Mr. H. W. Angus, borough electrical engineer, states that the total revenue was £50,840, as compared with £50,625 in the preceding year. Working costs, including bulk supply purchased, amounted to £36,175, against £36,292, and there was a net surplus, after payment of interest and sinking fund charges, of £4,418 (£4,851). The total capital expenditure now stands at £218,133, of which £21,587 was spent during the year. Compared with 1929-30, the electrical energy consumed for domestic purposes shows an increase of 13½ per cent. Industrial power consumption, however, fell by 15½ per cent., and public lighting by 14¾ per cent., with the result that the total sales declined from 8,478,234 to 8,074,208 kWh. The maximum demand was 3,612 kW, as against 3,672 kW, while the average price obtained per kWh was 1.47d. (1.37d.).

Eglwysfach (Card.).—INAUGURATION OF SUPPLY.—A supply of electricity to the village was inaugurated on December 12th. The approximate cost of the scheme is £4,000, the charge being 9d. per kWh.

Fleetwood.—LOAN FOR SUB-STATIONS.—The Urban District Council is applying for sanction to a loan of £2,000 for sub-station buildings and £5,000 for equipment.

Gamlingay (Beds).—RURAL ELECTRIFICATION.—The Parish Council, having inquired from the Bedfordshire, Cambridgeshire and Huntingdonshire Electricity Co. with regard to a supply of electricity in the rural district, has been informed that the company has under consideration the erection of a transmission line from Eltisley to Gransden, Waresley, and Gamlingay, continuing south to Tadlow, the Mordens, and through Litlington, Bassingbourn and Kneesworth, connecting up with the existing supply near Meldreth.

Glasgow.—MAINS EXTENSIONS.—The Electricity Committee recommends the laying of distributing mains at a cost of £1,149.

PROGRESS DURING NOVEMBER.—Under the Electricity Department's scheme 220 houses were wired in November, making the total to date 34,871, while hired appliances numbered 100, bringing the total to 20,721.

SUPPLY TO SCHOOL.—The Electricity Committee is to afford a supply at a cost of £500 to a temporary school to be erected at Provanmill.

Hornsey.—REMOTE CONTROL.—The Electricity Committee is to adapt the convertor at Highgate station to remote control at a cost of £2,302.

India.—HYDRO-ELECTRIC SCHEME FOR HYDERABAD.—Nawab Ali Nawaz Jung Bahadur, chief engineer and secretary to H. E. H. the Nizam's Government in the Public Works Department, who has been on a six months' tour of Europe to inspect the latest developments in engineering, has returned to Hyderabad. *Indian Engineering* states that his return will mark the beginning of another great push in the progress of engineering in the State, and that a big hydro-electric scheme is contemplated.

ELECTRICAL PROGRESS IN MADRAS.—According to the report of the electrical inspector to the Government of Madras for the year 1930-31, the number of towns with an electricity supply is twenty-one, of which four were electrified during the year. The total generating capacity of all undertakings amounts to nearly 33,000 kW.

Kingston-on-Thames.—LOANS.—The Town Council has applied for sanction to loans of £8,000 for an assisted wiring scheme, £6,000 for mains extensions, £1,237 for a supply in bulk to Bentalls, Ltd., and £10,282, capital cost of new switchboards, transformers, &c., at the power station.

BRITISH MATERIAL FOR ASSISTED WIRING.—The borough electrical engineer has been instructed to see that the material used in connection with the assisted wiring scheme is British.

Lancaster.—GRID SUPPLIES.—The Electricity Committee is not satisfied with the terms proposed by the Central Electricity Board for supplies of energy from the grid and has decided to ask the Board to reconsider its proposals.

London.—FULHAM.—The Electricity Committee is applying for sanction to a loan of £4,070 for the equipment of a sub-station and mains at Fulham Court. Another sub-station is to be erected in Moore Park Road and mains extensions are to be carried out at a cost of £2,530.

Maldon (Essex).—SPECIAL ORDER.—The County of London Electric Supply Co., Ltd., has applied to the Electricity Commissioners for a Special Order sanctioning the transfer to it of the electricity undertaking belonging to Messrs. John Sadd & Sons, Ltd.

Nottingham.—GRID SCHEME AGREEMENT.—The Corporation has given approval to a draft agreement with the Central Electricity Board with regard to the conditions of sale to the latter of electricity generated at the North Wilford power station. The agreement is to operate as from the beginning of the year.

Plymouth.—FREE-WIRING SCHEME.—The City Council has received sanction to a further loan of £10,000 in connection with the free-wiring scheme.

Preston.—MAINS EXTENSIONS.—The Electricity Committee is carrying out certain extensions of mains, and is applying for loans in respect of Brookhouse Mill (£1,800) and Much Hoole (£448), with the following additional amounts for the general purposes of the electricity undertaking for the ensuing three years:—Underground mains, £60,000; services, £30,000; overhead lines, £15,000; transformers and switchgear, £15,000; domestic apparatus, £60,000; meters, £25,000; and consumers' installations, £30,000.

Renfrew.—LIGHTING INSTALLATION FOR HOUSING SCHEME.—The County Council has granted a request of the First District Council for an expenditure of £2,000 on an electric lighting installation at Merrylee Park housing scheme in the Eastwood lighting area.

Ripon.—SUPPLY TO HARROGATE ROAD.—At a recent meeting of the Electricity Committee further reference was made to the desirability of an additional supply to Harrogate Road. It was decided that an estimate of the cost of a new feeder should be presented at an early date.

ELECTRICITY FOR RURAL AREA.—The City Council has received sanction to a loan of £16,000 for providing a supply of electricity in the rural area.

Shetland Islands.—ELECTRICITY SCHEME.—Sir Robert Hamilton, M.P. for Orkney and the Shetlands, and Under-Secretary of State for the Colonies, is actively pursuing a scheme for the provision of electric light and power for the Northern Isles. The supply is to be generated on the "Mainland"—the largest of the group of islands—and will be used first for supplying the town of Lerwick; later on, it is hoped, it will be extended to farms and villages throughout the island. The city electrical engineer of Aberdeen (Mr. J. A. Bell) is advising the promoters of the scheme, and most of the work will be done by local labour. It is proposed to generate the power by two oil engines. An application has been made for a grant from the Unemployment Grants Committee.

Skegness.—SUCCESS OF ILLUMINATIONS.—So successful was Skegness's first scheme of illuminations last September that the Carnival Committee has decided to undertake a much more ambitious project in illuminations and floodlighting next autumn.

South Westmorland.—SUPPLY NEXT AUTUMN.—The Special Order applied for by the South Westmorland Electricity Co. has been granted, and the district will be supplied with electricity next autumn.

Teddington.—LIGHTING OF CHAPELS.—The Urban District Council is considering the advisability of lighting the cemetery chapels by electricity.

Thorne.—STREET LIGHTING.—Following a communication from the Electrical Distribution of Yorkshire, Ltd., the Parish Council is to consider the question of lighting the streets by electricity.

Tynemouth.—YEAR'S WORKING.—In the Town Council's abstract of accounts, Mr. C. Turnbull, the electrical engineer, states that despite a reduction in charges the revenue from the electricity undertaking during the year ended March 31st last increased from £57,000 to £60,000. There was a marked fall in the demand from industrial consumers, but the domestic consumption increased. Electric fires, ovens and vacuum cleaners are stated to be increasing in popularity. The surplus for the year amounted to £7,953, as compared with £5,555 in the previous year. The rates were assisted to the extent of £2,094.

United States.—SAFE HARBOUR STATION IN OPERATION.—*Power* states that the first two 42,500-h.p. units in the $30,000,000 hydro-electric development of the Safe Harbour Water Power Corporation on the Susquehanna River have now been placed into service, nine months ahead of schedule. Two more units of the same size will be ready for operation early this year, the initial installation consisting of six turbines with a total capacity of 255,000 h.p. Six additional units are planned, which will give the plant an ultimate capacity of 510,000 h.p.

THE MADDEN DAM SCHEME.—Construction of the Madden Dam project on the Chagres River near the Panama Canal Zone will start early this year, according to the present plans of the Federal Government. In design the new dam will be of the gravity type, with its main section 900 ft. long, 200 ft. high at the maximum point, and 180 ft. wide at the base. When completed it will enlarge the facilities of the Panama Canal four times, prevent floods, and store water for the generation of electricity. The power installation will consist ultimately of three 6,600-V generators direct connected to three 11,200 h.p. water wheels. The latter will operate on a variable head of 75 to 145 ft., depending on the amount of water needed to maintain proper traffic level in the canal.

Traction

Accrington.—TRAMWAY ABANDONMENT.—The Traffic Commissioners for the north-western area have again considered the substitution of 'buses for trams on the existing tram route between Accrington and Blackburn. Accrington Corporation applied for a licence to run a service of 'buses between Accrington and Huncoat; it was expected that the substitution would take place early this month. Another section of tramways which would be replaced by 'bus services was between Accrington and Church. Both applications were granted.

Australia.—SYDNEY.—A scheme for the introduction of trolley-'buses and corridor tramcars on a number of suburban routes is being considered by the Transport Co-ordination Board.

PERTH.—For the year ended June 30th last the revenue from the city's tramway undertaking amounted to £304,051, as compared with £349,270 in 1929-30. There was a decrease from £294,471 to £260,997 in the working expenditure, while a net deficit of £9,367 compares with a net surplus of £3,277 in the preceding year. Revenue per car mile fell from 23.25d. to 21.81d.; the number of passengers carried declining from 35,565,867 to 31,180,072. Unemployment and trade depression are stated to be the cause of the somewhat disappointing results.

FREMANTLE.—The number of passengers carried by the municipal tramways during the year ended August 31st last fell from 5,856,457 to 4,967,222, and the car mileage from 628,737 to 581,800. The total revenue was £46,792, as against £55,735 in the previous year.

Barnard Castle.—AUTOMATIC TRAFFIC CONTROL.—The Urban Council is considering a proposal to erect an automatic traffic signal on the County Bridge at Barnard Castle.

Cheltenham.—AUTOMATIC TRAFFIC SIGNALS.—The Highways Committee is to obtain estimates for the provision of automatic traffic signals.

Continental.—SWEDEN.—The electrification of the main line connecting Stockholm with Malmö and Trälleborg, together with a number of junction lines, in all about 960 km., is proceeding according to programme, and it is hoped that the section between Stockholm and Norrkoeping will be completed next summer. The whole work, according to the plan approved by the Riksdag, should be finished by the end of 1933 or the beginning of 1934. In spite of the strain that the falling State revenues will put on the Budget, it is not probable that any delay will occur in the execution of the original programme, as this electrification scheme has proved a most valuable method of alleviating the unemployment caused by the general depression.—*Reuter's Trade Service* (Stockholm).

FRANCE.—The Chambers of Commerce of the 17th Economic Region are pressing for the electrification of the Brioude-Saint Fleur railway line which serves their area.—*Reuter's Trade Service* (Paris).

At a recent meeting of the General Council of the Seine Department it was decided to substitute 'buses for trams on fourteen routes in the centre of Paris.

Japan.—RAILWAY ELECTRIFICATION.—The I.G.R. proposes to start work shortly on the electrification of the Osaka-Suita section of the Otsu-Akashi line. Two sub-stations each of 6,000 or 8,000 kW will be erected and the whole scheme will be completed during the current year.

London.—DERAILMENT ON METROPOLITAN.—A derailment of three coaches at Baker Street just before 8.30 p.m. on December 23rd caused a considerable dislocation of traffic on the Metropolitan Railway. A single-line service was started shortly after 10.30, but it was not possible to run the normal service till early the following morning.

Luton.—TRAMWAY ABANDONMENT.—The Corporation has decided to apply for permission to substitute 'buses on all three existing tramway routes.

Salford.—ELECTRIC HEATING OF TRAMCARS.—Electric heating apparatus has now been installed in several of the Corporation's tramcars and the Tramways Department intends to equip further vehicles similarly when the time comes for reconditioning.

Scarborough.—SALE OF TRAMCARS.—The Corporation has sold the whole of the town's tramway service comprising 28 cars to Messrs. Grahamsley, of Gosforth, for scrapping. An omnibus service is taking its place.

Siam.—DIESEL-ELECTRIC LOCOMOTIVES.—The Royal State Railway authorities of Siam placed a contract last year for 19 Diesel-electric locomotives and motor coaches. The Frichs Locomotive and Machine Works of Aarhus, Holland, and Sulzer Bros., Winterthur, Switzerland, as main contractors, ordered the electrical equipment of the locomotives from the Oerlikon Co. Six 900-h.p. express locomotives and six 450-h.p. locomotives will be put into service in Siam by the end of the present year, while the remaining locomotives and motor coaches will reach Bangkok a little later. With a supply of about 2.8 tons of fuel, the locomotives are capable of hauling a train with a total weight of 260 tons at a speed of 31 m.p.h. The maximum speed is 37.2 m.p.h.

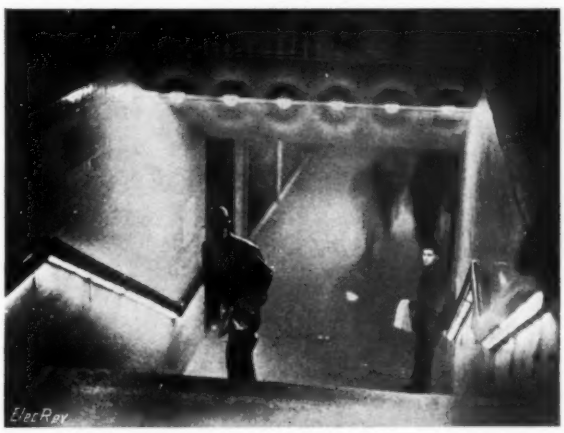
Southgate.—AUTOMATIC TRAFFIC SIGNALS.—The Urban District Council is considering the provision of automatic traffic signals.

Communications

Belgian Congo.—WIRELESS TELEPHONY.—The first talk by wireless telephone between Belgium and the Belgian Congo took place on December 22nd between the Minister of Colonies and the Governor of the Congo. This link-up was effected by means of the beam wireless stations at Ruysselede (Ghent) and Leopoldville in the Congo.—*Reuter* (Brussels).

British Broadcasting.—P.O. RELAY SCHEME.—It is reported that a scheme for relaying broadcast radio programmes to telephone subscribers may be considered by the Post Office. A choice of programmes would be possible, and each subscriber would have to pay the usual ten-shilling annual licence fee, plus an extra charge. The Post Office would erect masts, aerials, and receiving apparatus in central localities, every centre having several receivers each tuned permanently to a different station. Subscribers' loud speakers would be connected to their telephone wires, or a separate exchange circuit if normal telephone communication were required simultaneously. Owners of private relay services recently received notice that the Post Office may avail itself of its right to take over their stations and apparatus at valuation prices at the end of 1932.

United States.—RADIO-TELEPHONY TO BERMUDA.—The first wireless-telephone service to be inaugurated by Imperial and International Communications, Ltd., was opened on December 21st between Bermuda and New York. A working agreement has been made between Imperial and International Communications, Ltd., and the Bermuda Telephone Company whereby any subscriber may communicate with the New York station of the American Telephone and Telegraph Corporation, and therefrom over the widespread system of that company. The first conversations took place between the Governor and the American Consul in Bermuda and the British Ambassador and the Under-Secretary of State at Washington.



A novel way of lighting the steps at the Potsdamer Platz "Underground" station, which is Berlin's counterpart of the Piccadilly Station. The lamps fitted in the handrails provide ample illumination across the whole width of the stairway.

TELEVISION'S PROGRESS.—Although television has made great strides it has not yet reached the point at which the Federal Radio Commission will recognise commercial possibilities in visual broadcasting. The Commission, in its annual report submitted to Congress, states that there has been great improvement in the quality and in the amount of detail of images transmitted, but the available number of visual broadcasting frequencies puts a severe limit on the number of stations which may be operated without interference. At the end of the year there were 612 ordinary broadcasting stations in the United States, against 621 the year before. The Commission calls attention to the rapid increase in the use of radio by police, with 62 such stations now in operation, and also to the rapid increase of communication by radio-telephone and radio-telegraph in aviation and in ships at sea.—*Reuter* (Washington).

On his return to this country last week from America, Mr. John L. Baird is reported to have announced that one of the largest radio broadcasting stations in New York had concluded a contract to transmit television by his system daily for five years.

London Telephone Area.—EXTENSION.—The Greater London telephone area is to be enlarged to about 1,000 sq. miles, thus bringing some 50,000 additional subscribers into the London directory. The number of public kiosks is to be greatly added to, and the "on demand" trunk service recently made available to the Birmingham district is to be extended to Manchester, Leeds, and Bristol. Within the next year fifteen London exchanges should be converted to automatic operation. Three of them, Hampstead, Acorn (Acton), and Southall will be opened this month, and others will be at Barnes, Richmond, and Ealing (March), South Harrow (May), Bayswater (June), Merton (August), Hither Green, Tulse Hill and Hendon (September), North Harrow (October), Bethnal Green and Bowes Park (December).

Contract Information

When "Contracts Open" are advertised in our "Official Notice" pages the date of the "Electrical Review" containing the advertisement is given in parentheses below

Contracts Open

Australia.—MELBOURNE.—January 20th. City Council. Ring main metalclad 6,600-V switchgear. (A.X. 11210.)*
February 3rd. Totally enclosed metalclad 6,600-V switchgear. (A.X. 11211.)*

Belgium.—BRUSSELS.—January 13th. Société Nationale des Chemins de Fer Belges, Service du Matériel, Division des Achats, Bureau 26-5, 21, Rue du Louvain, Brussels. Nineteen sets of motor-generators for electric signalling sub-stations.

Belper (DERBYSHIRE).—January 7th. Urban District Council. Two small electrically driven pumping sets, &c., for the sewage disposal works. Particulars from Messrs. Charles J. Lomax & Sons, engineers, 37, Cross Street, Manchester.
January 8th. County Council. Electric lighting installation at Infirmary. Particulars from the county architect.

Bentley-with-Arksey (WEST RIDING).—January 14th. County Education Committee. Electric lighting installation at the special subjects' block at the Bentley Road Council School. Specifications from the education officer, County Hall, Wakefield.

Brampton Bierlow (WEST RIDING).—January 14th. County Education Committee. Electric lighting installation at new infants' school. Specifications from the education officer, county Hall, Wakefield.

Eastleigh and Bishopstoke.—January 8th. Urban District Council. Installation of generating plant, cables, wiring, &c., at the Isolation Hospital. Specifications (deposit £1) from Mr. F. C. Lee, engineer and surveyor, Town Hall, Eastleigh.

Edinburgh.—January 13th. Corporation. Various works at valve house to be erected at Portobello power station. Schedules, &c., from the city architect.

Egypt.—CAIRO.—January 9th. Ministry of Public Works. Two electrically driven pumping sets, with accessories for floating dock. (G.X. 10989.)*
January 23rd. Ministry of the Interior. 3,175 meters for Mansourah. (A.X. 11215.)
February 18th. Diesel engine driven power station (400 kVA) for Samallout. (A.X. 11209.)*
February 18th. Water works with electric pumping equipment for Samallout. (G.X. 10962.)*

Epsom.—January 11th. Urban District Council. Wiring under assisted wiring scheme. Particulars from Mr. H. W. Watts, resident electrical engineer.

Galloway.—January 15th. Galloway Water Power Co. 11,000-V overhead line between Glenlee power station and High Bridge of Dee. (December 18th.)

Glasgow.—January 4th. Corporation. Electric lighting installation work for Cathedral Street rehousing scheme. Specifications, &c., from the general manager, Electricity Department, 4, West Regent Street, Glasgow, C.2.

Halifax.—January 2nd. Tramways Committee. Electrical work at omnibus garage, Elm Wood. Specification and form of tender (deposit £2 2s.) from Mr. A. C. Tipple, borough engineer, Crossley Street.

Hamilton.—Electricity Department. E.h.p. and l.p. underground cables. (December 18th.)

Knaresborough.—West Riding County Council. Electrical engineer's work at Sanatorium, Scotton Banks. Specification No. 7 (deposit £5) from the county architect, County Hall, Wakefield.

Liverpool.—January 21st. Corporation. Twelve months' supply of electrical materials. (See this issue.)

London.—CENTRAL ELECTRICITY BOARD.—January 25th. Construction of site works, foundation works, &c., (*a*) at Portishead and Upper Boat for the South-West England and South Wales Electricity Scheme, and (*b*) at Carlisle, Padiham and Kearsley for the North-West England and North Wales Electricity Scheme. (December 18th.)
February 15th. Central indication and telephone equipment and supervisory control equipment in the North-West England and North Wales area. (December 18th.)

New Zealand.—WELLINGTON.—February 8th. Post and Telegraph Department. 35,000 telephone dry cells. (A.X. 11212.)*
February 23rd.—Public Works Department. Four 1,000-kVA single-phase transformers, with automatic voltage regulating equipment. (A.X. 11213.)*
February 9th. Control and power cables for Waitaki power station. (A.X. 11214.)*

New Mill (NEAR HUDDERSFIELD).—January 20th. Urban District Council. Overhead lines. (See this issue.)

Northern Ireland.—BELFAST.—January 22nd. Electricity Department. General stores. (See this issue.)
ELECTRICITY BOARD.—January 18th. 33-kV overhead transmission line. (December 11th.)

Portsmouth.—January 14th. Electricity Department. Overhead e.h.p. and l.p. lines in East Hants and West Sussex. (See this issue.)

Southend-on-Sea.—February 3rd. Electricity Department. General stores. (See this issue.)

West Ham.—January 18th. Education Committee. Installation of electric lighting at Carter Road Central School. (December 25th.)

Wolverhampton.—January 9th. Corporation. Electrical installation at the Wolverhampton and Staffordshire Technical College. (See this issue.)

* Further particulars can be obtained at the Department of Overseas Trade (Inquiry Room), 35, Old Queen Street, S.W.1.

Contracts Closed

Barrow-in-Furness.—Health Committee. Accepted. Battery for electric vehicle (£149).—Chloride Electrical Storage Co., Ltd.

Glasgow.—Education Committee. Accepted. Electrical work at St. Patrick's (Boys') School annexe (£134).—Grindlay, Ross & Co.
Electricity Committee. Accepted. Plant required in connection with the change of frequency. Three alternators, rewound; 26 new motors; two new fans (£27,267).—Metropolitan-Vickers. 20,000- and 6,500-V switchgear (£1,624).—A. Reyrolle & Co., Ltd. Thirteen new motors (£655).—Bruce, Peebles & Co. 192 new motors (£3,142).—English Electric Co. 13 new motors; one new fan; five lift motors; welding set, reconditioned; spares for motors (£1,756).—Harland Engineering Co. 23 new motors (£656).—Lancashire Dynamo & Motor Co. 25 new motors; two rewound motors (£1,262).—Macfarlane Engineering Co. Ten new motors; five motors, exchanged (£88).—Crompton Parkinson, Ltd. One alternator, rewound (£1,402).—C. A. Parsons & Co. 21 new motors (£286).—Luth & Rosen. 47 new motors (£522).—A.S.E.A. Co. Five new motors (£82).—Electric Construction Co. Five motors, exchanged (£131).—Hobart Manufacturing Co. Three new fan motors; five fan motors, exchanged (£86).—Keith, Blackman & Co.
Housing Committee. Recommended. Electrical installations in 672 houses at Balmore Road housing scheme (£2,587).—R. J. McIntyre.
Municipal Transport Committee. Recommended. Alterations necessary to render the 5,000-kW turbine at Pinkston power station suitable to operate under high-pressure conditions and for general overhaul (£3,792).—British Thomson-Houston Co.
Health Committee. Recommended. Electric lighting of new house for assistant medical superintendent at Hawkhead Mental Hospital (£215).—D. Henderson.

Hornsey.—Electricity Committee. Recommended. Meters for twelve months.—Reason Manufacturing Co., Ltd.; Ferranti, Ltd.; Chamberlain & Hookham, Ltd. Time switches for twelve months.—Venner Time Switches, Ltd.

London.—BETHNAL GREEN.—Borough Council. Accepted. Electrical installation at block No. 8 on the L.C.C. Collingwood estate.—Alpha Manufacturing & Electrical Co., Ltd.

Oxfordshire.—Local Government Committee. Recommended. Installation of telephone system at county offices (£198).—Siemens Bros. & Co., Ltd.

South Africa.—CAPE TOWN.—City Council. Accepted. L.p. and h.p. switchgear (£12,317).—A. Reyrolle & Co.

Stoke-on-Trent.—Housing Committee. Accepted. Electrical wiring and fittings in fifty houses at Mear estate.—Edstan Electric Co. Electrical wiring and fittings at seventy-six houses on the estate.—E. Holloway.

Wolverhampton.—Town Council. Accepted. Supply and installation of sludge pumps and electric motors for the sewage purification and disposal scheme at Barnhurst (£2,093).—Hayward-Tyler & Co., Ltd.

Wrexham.—Town Council. Accepted. Electric wiring of houses at Acton Park (£1,828).—C. Pressland.

Forthcoming Events

Association of Mining Electrical Engineers (*London Branch*).—Tuesday, January 5th. Junior Institution of Engineers, London. 6.30 p.m. "Insulator Reliability in Service." Mr. R. C. Andersen. (*Western Sub-Branch*).—Saturday, January 9th. Y.M.C.A., Swansea. "Transformers." Capt. MacIntosh.

British Electrical Development Association (*Northern Counties Area*).—Thursday, January 7th. Sopwith's Lounge, Newcastle-upon-Tyne. 7.15 p.m. Discussion on "Development—The Industry and Your Part in It." Opened by the Director of E.D.A. (*North Midland Area*).—Thursday, January 7th. Electricity Works, Whitehall Road, Leeds. 7 p.m. "Lighting in Churches, Art Galleries, Hospitals, &c." Mr. W. J. Jones.

Institution of Electrical Engineers.—Thursday, January 7th. Institution, London. 6 p.m. "Methods and Equipment in Cable Telegraphy." Messrs. H. Kingsbury and R. A. Goodman. (*Wireless Section*).—Wednesday, January 6th. Institution, London. 6 p.m. "Multi-Channel Television." Mr. C. O. Browne. (*Meter and Instrument Section*).—Friday, January 8th. Institution, London. 7 p.m. "Some Recent Advances in the Design of Relays for the Protection of A.C. Systems." Mr. C. L. Lipman.

Illuminating Engineering Society.—Friday, January 8th. Royal Society of Arts, Adelphi, W.C. 7 p.m. "Motor Car Headlights." Mr. E. S. Calvert.

Junior Institution of Engineers.—Friday, January 8th. Institution, London. 7.30 p.m. "Refrigeration—Modern Practice and Practical Calculations." Mr. B. C. Oldham.

Our Service Department

Inquiries must be accompanied by a stamped addressed envelope.

We shall be glad to learn the names and addresses of the makers of the following:—

BOIS BAKELISÉ.
Preparation for quickly removing enamel covering from wire to facilitate connecting up of coils.

Notes

" Superconductivity "

That astonishing advances in the subject of " superconductivity " may be expected during the new year is the opinion expressed by Prof. E. N. da C. Andrade in the *Sunday Times*. Superconductivity is the abnormal decrease in resistance in several metals at very low temperatures. Thus, we might expect a lead wire at a temperature of 268 deg. C. (5 deg. above absolute zero) to have 60 times its conductance at ordinary temperatures; actually, its conductance is about 800 million times as much. No satisfactory explanation of this phenomenon is yet available, and it seems quite likely that such an explanation would provide the key, not only to the whole problem of conduction, but also to the production of alloys that will have abnormally good conductivity at ordinary temperatures.

The investigation of superconductivity requires a cryogenic laboratory (*i.e.*, one in which extreme cold can be produced), of which there are examples in Toronto, Leyden, and Berlin; a fourth is being equipped at Cambridge. Prof. J. C. McLennan, at Toronto, has recently discovered that the use of high-frequency alternating currents reveals a new aspect of superconductivity, which he appears to have produced at a temperature higher than that at which it has been hitherto detected.

Power-factor Correction in New Zealand

Extreme simplicity characterises a recently completed substation of the South Canterbury Electric Power Board at Waimate in New Zealand. Its function is to step down from 11 to 6.6 kV and to 415/240 V for local distribution. In addition to the transforming equipment, an induction voltage regulator of 850-kVA capacity has been added on the 11-kV side. It is of the outdoor type and entirely automatic, the control gear being contained in a weatherproof box at the side of the regulator. Also a static condenser has been connected direct to the 11-kV incoming lines for power-factor correction purposes. It is of the oil-filled type, with 33-kV oil-filled bushing insulators. According to the *New Zealand Electrical Journal*, this is an entirely new departure so far as New Zealand and Australia are concerned. The work was carried out by the Alliance Electrical Co., Ltd., N.Z. representatives of E. Haefely & Co.

Electricity from Exhaust Gas

Nearly all recently built motor ships are provided with exhaust-gas boilers, and probably none will be projected in the future unless provision is made to utilise some of the heat in the exhaust gases of the engines for raising steam for auxiliary purposes. Some interesting and important developments are now being made, says the *Motor Ship*, which include a further extension of the employment of steam raised by exhaust gases for generating electric power on ships inaugurated a short time ago, and this policy is to be followed on the 17-knot Hamburg-Amerika Line passenger liners now being built for the West Indies service. On the seven double-acting-engined tankers under construction for the Standard Oil Co. and its subsidiaries in Europe the exhaust steam will largely be employed for driving dynamos. These installations will be of exceptional interest, since the exhaust-gas boilers will incorporate a superheater and feed heater, the former being wholly enclosed within a spark arrestor, and the latter located at the top of the boiler, so that no additional space is needed.

The Batti-Wallahs' Society

The chief guest of the next luncheon of the Batti-Wallahs' Society, which will be held at the Hotel Metropole on January 21st, will be Mr. L. C. M. S. Amery, who will deliver an address on the " Monetary Position."

The annual dinner and dance of the Society will be held on March 18th at the Hotel Metropole.

Aeroplane Loud Speakers

The Air Ministry confirms a report from New York that it has purchased new apparatus whereby a person in an aeroplane high in the air is able to communicate in loud tones with persons on the ground. One of these sets has been fitted into a Vickers-Victoria transport aircraft to see if Political Officers in Irak can use this means for obtaining direct personal contact with the tribes, in place of the existing methods of dropping leaflets, &c. The apparatus embodies a system which, while it is in use in America, has so far not been developed in this country. It is stated that people on the ground can hear speech from the machine when the latter is 4,000 ft. up.

Electricity on Battleships

The first large warship to be propelled by internal-combustion engines is the "Deutschland," the machinery for which has just undergone its delivery trials at the works of the Maschinenfabrik Augsburg, Nürnberg, Germany. Noteworthy departures from current practice are the high speed, light weight, and welded framework of the eight Diesel engines, which develop 56,800 b.h.p. Weight limitation was of primary importance. The auxiliaries are electrically driven; the eight dynamos of 250 kW each were built by the A.E.G. and the Diesel engines to drive them by the Linke-Hofmann-Busch Werke, Breslau. Their speed is 1,000 r.p.m. and their weight without dynamo is about the same as that of the main engines, which is 17.6 lb. per b.h.p.

An E.A.W. Cup

Realising that many individual members of the Electrical Association for Women have contributed very considerably to its success by bringing in large numbers of new members, the President, Lady Moir, O.B.E., has decided to present a " Membership Cup " to the individual who brings in the largest number of new members during a year. The first presentation of the cup, however, at the annual general meeting in April, will be to the member who has introduced the largest number since the inception of the Association. After that it will be awarded to the member who brings in the most new members in any one year, commencing on January 1st.

Institute of Metals

In view of the disturbed economic and financial conditions that prevail in Europe and America the Council of the Institute of Metals has found it necessary to postpone the 1932 meeting, which was to have been held in the United States and Canada next autumn. An announcement regarding the Institute's place of meeting next autumn will be made shortly. The Institute finished the year with a net gain in its membership of 72, as compared with a net gain, in 1930, of 38, thus making the total membership 2,232, which is the highest figure ever recorded.

Appointments Vacant

Assistant engineer for the Installation Department of the Swinton and Pendlebury Electricity Department.

(See our advertisement pages to-day.)

Electric Vehicle Progress in France

According to the *Revue Générale de l'Electricité*, steady progress has been made during the past year in connection with the adoption of electric motor vehicles in France. The progress is mainly in the direction of vehicles for use in connection with municipal work, electrically propelled dust-collecting vehicles being now in use in about fifteen French towns, notably Marseilles, Strasburg, Tours, Colmar, and Havre.

A New Light Alloy

Hitherto the only structural light alloys that combine strength with good ductility have owed those properties to some form of heat treatment, whether in the cast or worked condition. They can only be worked in an annealed condition, or immediately following quenching, and must always be heat treated after any appreciable hot or cold work has been done on them if they are to retain their mechanical properties unimpaired.

These facts militate against their general use for structural purposes in place of mild steel when heat-treating facilities are not always available. They have led to the development of a range of new " straight " alloys possessing considerable tensile strength and reasonably good elongation, obtained partly by cold working instead of heat treatment, and a newcomer in this range is being marketed by James Booth & Co., Ltd., under the name of " MG7 " alloy. A memorandum on the subject issued by the British Aluminium Co., Ltd., explains that it is protected by patent and is composed mainly of aluminium in combination with magnesium and manganese in such proportions as to produce a material having a specific gravity of only 2.63, whilst its mechanical properties are similar to those called for by the British Standard specifications for the well-known wrought light alloy " Duralumin."

The most interesting properties of this material are its very high resistance to corrosion and mechanical strength. In the rolled form it is stronger than rolled and heat-treated " Duralumin." In the form of bars and forgings, the strength of the material is about two or three tons lower than that of " Duralumin," whilst in the form of tubes its strength is practically identical to that of heat-treated " Duralumin." The metal is not capable of heat treatment and variations in its strength can only be brought about by the application of differing amounts of cold work.

Controlled-grid Rectifiers

In our last issue, on p. 951, an article on " Controlled-grid Rectifiers " appeared. It was there stated that the tests on the rectifiers were carried out by Messrs. Bruce, Peebles & Co., Ltd., at Baden. The tests were actually carried out by Messrs. Brown, Boveri & Co., Ltd., Messrs. Bruce, Peebles holding a licence for manufacture in Great Britain.

Domestic Hot Water in the U.S.A.

An investigation into the possibilities of domestic water heating by the National Electric Light Association (U.S.A.) leads to several conclusions, among which are: (1) The average consumer will pay from 12s. to 20s. per month for hot water, requiring from 3,000 to 4,000 kWh per annum; (2) *continuous* hot water service should be encouraged; (3) installation work should be supervised by especially qualified men; (4) for ordinary conditions the size of the element should not exceed 2 kW and the capacity of the tank should not be less than 30 gal.; (5) the temperature of the hot water at the tap should be between 130 and 140 deg. F.; (6) heaters should not be installed in circulating pipe systems; (7) electric water heaters, owing to their many advantages, can be profitably installed even where natural gas is available; (8) long-term payments must be allowed; and (9) there can be no satisfactory progress, even with low rates, where the supply undertaking does not assume responsibility for sales development. One company provides 60-gal. tanks for four persons in a family, 100-gal.

for five or six persons, and 150-gal. for seven to nine persons at annual rents of $36, 42, and 48 respectively, with an addition of one cent per kWh. Electricity used per month for the three sizes averaged 350, 572, and 752 kWh. Another company sold 413 off-peak heaters between March, 1930, and March, 1931, with a connected load of 867 kW and an average consumption of 344 kWh per month. The tariff is one cent per kWh plus a service charge of 50 cents per month per kW connected.

In commenting on the committee's report the N.E.L.A. Bulletin says that an analysis of the data indicates clearly that electric water heating is not only feasible, but is also a highly profitable load for any central station irrespective of its existing load curves. "When we consider that certain systems of electric water heating require little or no added investment and that the kilowatt-hour consumption of the water heater is that of two or three times that of the electric range, six or eight times that of the refrigerator, and at least sixty times that of the flat iron, it would appear that the central station industry should give the development of this load serious consideration."

British Broadcasting in 1931

In a review of its work during 1931, the B.B.C. states that activity on the engineering side has been particularly marked. The total number of transmitting hours for the year ended September 26th, 1931, was over 67,000 hours and the percentage of breakdown time was 0.03. This compares with 72,000 hours last year and a percentage of 0.04, the decrease in hours being accounted for by the closing of certain relay transmitters. A large part of the office accommodation at the new Broadcasting House was taken over in September, and work on the special engineering plant (air-conditioning plant, standby power supply, technical wiring, &c.), has been completed. The control room equipment has also been installed. The north regional station was completed during the early part of the year; the Scottish regional station building is complete and the installation of plant is in hand. A site for the west regional station has been purchased near Watchet, Somerset, and the contract for the building has been placed.

The new Empire broadcasting station at Daventry will comprise two transmitters, each capable of working on a number of wavelengths, and it is expected that the station will be available for service in about a year's time.

In co-operation with the Marconi Company an ultra-short-wave transmitter (6.5 to 8 metres) will be installed in Broadcasting House in order to permit investigations into the suitability or otherwise of waves of this length for broadcasting purposes.

At the Scottish regional headquarters in Edinburgh new control room equipment is being supplied, while in the west region a talks studio and offices were opened in Bristol. Negotiations are at present proceeding for an extension of the midland regional headquarters at Birmingham. In the north region new premises have been obtained in Leeds and the work of conversion is now in hand.

Work has proceeded throughout the year on the new cable system for interlinking stations in place of the overhead circuits used since 1923.

The result of the recent meeting of the Union International de Radiodiffusion held in Rome indicated that although international agreement was not forthcoming for a general revision of the Prague wavelength plan, yet it was possible to arrange for minor changes which have resulted in a reduction in interference among the restricted number of stations to which they were applied. The British transmitters affected are north regional, London regional, and London national, and the change has had very satisfactory results.

Extensive use has been made of the "Blattnerphone" recording apparatus, by means of which the whole of a 20-min. talk can be preserved on a magnetised steel tape and reproduced when required.

The Shannon Scheme

Speaking in Dublin recently, Mr. McGilligan, Minister for Industry and Commerce, I.F.S., stated, according to the *Irish Times*, that he had no intention of interfering with the decisions of the Electricity Supply Board, which he wanted still to be an independent body. He had found it necessary, however, to intervene to get the financial position cleared up, as the auditors' report for the period from November 1st, 1929, to March 31st, 1930, showed that the nature and extent of the capital commitments of the Board at the latter date could not be ascertained.

It had been found that the revenue under existing conditions would not be enough to meet interest, sinking fund, and other fixed charges of the undertaking, and the Board had therefore decided to increase the charges to consumers. The average domestic rate for the whole country would be raised from 2.73d. to 3.0d. per kWh, as compared with 2.8d. in 1929-30, and for other services similarly. The Board was supplying energy in Dublin for all purposes, excluding traction, at 2.3d. per kWh, as opposed to 2.7d. in the last year of the undertaking's independence. Outside of Dublin electricity was everywhere sold for lighting at 4d. No area was paying more than it did before receiving a supply from the Board, while many were paying very considerably less as an average.

The actual cost of the Shannon Scheme had exceeded by less than the contingency margin of 10 per cent. the estimated figure of £5,200,000, but the full cost was £5,850,000, due to explainable factors. The consumption might have to be three times that obtaining when the works were started, and if 110 million kWh was sold in 1932-33 at 0.84d. per kWh (average) it would put the scheme on a sound basis, on the assumption that the capital expenditure was that originally estimated.

Display Lighting. By H. E. Hutter, A.Am.I.E.E.

THE use of coloured light for display purposes requires careful consideration, due to the apparent change of colour of an object when under light of different colours.

Colour may be advantageously employed to enhance the appearance and increase the attractiveness of displays by adding depth and tone to the inherent colours of the merchandise in conjunction with which it employed. Colour should, however, be used with descretion and with an understanding of the effect of coloured light on coloured objects.

Colour can be used without being obvious; the result of its presence should create the feeling that the merchandise looks particularly attractive. To accomplish this result colour screens should be installed after the window is dressed, in order to accentuate the predominating colours of the objects on display. For example, a window display may consist of garments of several different hues. In order that each may appear to its best advantage, the window should be flooded with clear light and then colour similar to that of the merchandise itself should be directed on the principal displays. When there is one predominating colour, for example, a display of blue shirts, a slight touch of blue light will give a richer, more appealing, appearance to the merchandise.

There is a surprising difference in the appearance of a display under clear or unmodified light as compared with one of similar character under light to which a touch of colour has been added. Sometimes colour devices on one or two of the existing window units will be sufficient to obtain effective results.

Basic Principles

Light is usually considered as having three primary colours: red, green, and blue, any two of which may be mixed to obtain any other colours. The primary colours of light are different from those of pigments, which are red, yellow, and blue. The reason for this difference is that when pigments are mixed colour is produced by a subtractive method, contrary to the production of colours by combining various other colours, which is called the additive method. To understand this it must be realised that when a ray of white light strikes a yellow object all except the yellow light is absorbed. The yellow light is either reflected or transmitted, and the same thing occurs in the case of other colours. Coloured light is usually produced commercially by passing white light through a filter, which absorbs all the colours except the one desired, the rays of which are transmitted. Various substances are used for filters, such as glass, lacquer, gelatine, fabric, and pigments.

The following Table I shows the transmission of coloured light through various colour media in percentages of the original clear light as produced by an incandescent lamp.

TABLE I.—PRACTICAL EFFICIENCIES OF COLOUR MEDIA.

	Blue %	Green %	Red %	Amber %
Natural glass bulbs	0.6	8.7	3.0	45
Coloured glass accessories	7.5	8.5	21	33
Gelatine	1.3	17.0	5.2	48
Dyes and lacquers	5.0	2.5	20	50
Inside coloured lamps	0.4	3.5	5.7	50

The choice of colour media is determined by the manner in which they are to be used, and the desired permanence of the installation.

Table II shows the apparent colours of objects under different colour lights.

TABLE II.—APPARENT COLOURS.

Actual Colour.	Apparent Colour.	Actual Colour.	Apparent Colour.
Under Red Light.		*Under Green Light.*	
Black	Purple-Black	Black	Greenish-Brown
White	Red	White	Green
Red	Redder	Red	Brown
Dark Green	Red-Black	Green	More brilliant
Light Blue	Violet	Orange	Yellow
Under Amber Light		*Under Blue Light*	
Black	Brown-Black	Black	Blue-Black
White	Amber	White	Blue
Orange	Yellow-Orange	Orange	Brown
Green	Brown-Green	Green	Blueish-Green
Blue	Grey	Red	Violet

Daylight Matching

At times it is important to reproduce the colour quality of average daylight for the purpose of matching coloured objects, such as fabrics. For reproducing daylight a blue colour filter may be used with an incandescent lamp, allowing the transmission of only the correct proportion of each wave band to give the desired colour quality of the transmitted light. For approximate results the "daylight" lamp, or enclosing globes of blue glass, may be used, but wherever accurate identification must be made special colour filters must be employed.

Our Personal Column

Electrical men are invited to enable us to keep readers of the "Electrical Review" posted concerning their movements

We regret to learn that **Sir James Fortescue-Flannery,** who is 80 years of age, recently had a bad fall and is believed to have broken an ankle. He was walking in a field near his home, Wethersfield Manor, Essex, and slipped on some mud. Sir James is a director of a number of companies and is chairman of Callender's Cable & Construction Co., Ltd., and the Anchor Cable Co., Ltd.

[*Schmidt, Manchester*
Dr. F. S. Sinnatt.

Dr. F. S. Sinnatt, whose appointment as Director of Fuel Research under the Department of Scientific and Industrial Research was announced in our last issue, received his education at the Manchester College of Technology, where he later became successively assistant lecturer in technical chemistry and head of the Fuel Section. He participated as Director of Research, in the formation of the Lancashire and Cheshire Coal Research Association and also initiated the Coal Survey of 1918. He is a member of a number of societies, including the Institutions of Mining and Chemical Engineers, and the Institute of Fuel, of which he is a member of the Council. He is the author of many papers on coal and Allied subjects.

Mr. John Ford, of Newcastle, who has retired after 37 years' service with the Parsons' Marine Steam Turbine Co., Ltd., has been presented with a piece of silver plate and a gold albert by the directors, officials and employés of the company. For the last 25 years Mr. Ford has been manager of the Turbinia Works at Wallsend, where he has been largely responsible for the construction of turbines from the first turbine-driven vessel "Turbinia" to the latest example of high-pressure turbine machinery installed in H.M.S. "Acheron."

Major J. E. Hahn, chairman of the board and president of Consolidated Industries, Ltd., of Canada, manufacturers of electrical household appliances, is visiting this country for the purpose of meeting interested British industrialists and acquiring the Canadian rights of merchandise that would fit in with the present manufacturing and distributing facilities of the company. Major Hahn entered the radio field in 1922 and organised the De Forest Radio Corporation, of Toronto. He acquired a valuable group of patents, and on this basis developed a radio manufacturing organisation which now operates as a subsidiary company of Consolidated Industries, Ltd. Major Hahn will be in London during the week commencing January 10th.

Major J. E. Hahn, president of Consolidated Industries, Ltd

The Stockport Corporation Electricity Committee recommends the appointment of **Mr. C. H. Oldroyd,** the deputy electrical engineer, as electrical engineer in succession to Mr. Robert Lee, who was recently appointed electrical engineer to the borough of St. Pancras. Mr. Oldroyd, who has been a member of the staff since 1907, was one of seven candidates for the post, which carries a salary of £900 a year, rising to £1,000.

Mr. H. W. Bosworth, joint managing director of the Lancashire Dynamo & Crypto Co., Ltd., has now returned to London after a three months' business tour in South Africa. During his tour he visited Northern and Southern Rhodesia, and the Union of South Africa, and has made revised arrangements for the representation of the Lancashire Company in those territories.

Mr. J. M. Johnston, North of England manager for the Stirling Boiler Co., Ltd., with offices in Manchester, retired on superannuation at the close of the year. Mr. Johnston has been actively associated with the company since 1906, and his duties have brought him into contact with engineers in all parts of the North of England.

Sir John Gordon Nairne has retired from the board of the British Broadcasting Corporation, and **Mr. Harold G. Brown** has been appointed a governor to fill the vacancy for a period of five years. Lady Snowden, Lord Gainford, and Dr. M. J. Rendall, have accepted invitations to remain in office for a further period of one year, when the constitution of the board will again be considered.

Mr. G. F. Preston is shortly retiring from the British Electrical & Allied Industries Research Association, after serving as secretary to the Council for the past six years.

Mr. John A. Crabtree has revealed to us that his activities in connection with switches and economics are not the only manifestations of his versatility. A New Year card which we have received from him and Mrs. Crabtree contains a drawing of a smith at his forge which shows that he is also an artist of no mean order.

Mr. Charles H. Logan, late installation engineer of the Forest City Electrical Co., Ltd., has joined the staff of the Revo Electric Co., Ltd., as sales and installation engineer to the Traffic Signal Department.

Monsieur P. M. Boucherot, professor at the Ecole Supérieure d'Electricité, of Paris, has recently been appointed an Officer of the Legion of Honour in appreciation of his long service with that institution.

Mr. R. G. Devey is chief electrical engineer to Messrs. Lever Brothers, Ltd., and its world-wide ramifications. He took up his present appointment in 1913, having previously been a member of the technical staff of Messrs. Dick Kerr & Co., Ltd., which is now a constituent part of the English Electric Co., Ltd. Mr. Devey has throughout his professional career specialised in industrial electrical engineering. He is a member of the Institution of Electrical Engineers, and serves on the Mersey and North Wales (Liverpool) Centre of the Institution. A description of Port Sunlight power station, for which Mr. Devey is responsible, appears in pages 13 and 14 of this issue.

[*Lafayette*
Mr. R. G. Devey, M.I.E.E., chief electrical engineer to Lever Bros., Ltd.

Obituary

Mr. E. Berkeley.—We regret to learn that Mr. Edward Berkeley, of 11, Chesterford Gardens, Hampstead, brother of Arthur Berkeley, and son of the late Jonas Bergtheil, passed away suddenly on December 28th. Mr. Berkeley and his brother were motoring in the neighbourhood of Birchington when he was seized with an attack of angina pectoris. He was removed to premises in a village through which they were passing and died in a few minutes. He was a director of Indeuram, Ltd., and of the Micanite and Insulators Co., Ltd., and had been connected with the electrical industry for practically the whole of his life.

[*City Studio.*
The late Mr. E. Berkeley

Herr von Gwinner.—Herr Arthur von Gwinner, whose death at the age of 75 years has just occurred in Berlin, was brought into association with the Deutsche Bank by Herr Georg von Siemens in 1894, and he was a director of that bank for 25 years. He was its president for some time and resigned after the war. Herr von Gwinner was responsible for the bank extending its operations into the electrical field and, according to *The Times*, the German-Overseas Electric Company, which became Spanish, was one of his chief interests.

Will.—Mr. P. Brown, vice-chairman and joint managing director of David Brown & Sons (Huddersfield), Ltd., left £157,376 (net personalty £148,033).

Financial Section

New Companies, Returns of Share Capital, Debenture Charges, Reports of Electrical Companies, Dividend Changes, Transactions in Stocks and Shares

New Companies Registered

West Devon Electric Supply Co., Ltd.—Public company. Registered December 23rd. Capital, £150,000 in £1 shares (60,000 6 per cent. cumulative preference and 90,000 ordinary). Objects: To acquire and take over as going concerns and carry on in all their branches the businesses of electricity supply undertakings carried on by W. G. Heath and various other persons, firms, and limited companies at Okehampton, Tavistock, Chagford, Yelverton, Hatherleigh, Bere Alston, and Horrabridge, and other places, all in Devon, under the respective styles of the Okehampton Electric Supply Co., the Tavistock Electric Supply Co., the Chagford Electric Supply Co., the Yelverton Electric Supply Co., the Hatherleigh Electric Supply Co., the Bere Alston Electric Co., Ltd., and the Horrabridge and District Electric Supply Co., Ltd., and to adopt agreements (1) with W. G. Heath, and (2) with Christy Brothers & Co., Ltd. The first directors are: W. G. Heath, 41, George Street, Plymouth; F. Christy, Ramswell, Roxwell Road, Chelmsford; H. J. Aylott, Greengates, Mildmay Road, Chelmsford; G. Christy, Ramswell, Roxwell Road, Chelmsford; H. Hurrell, Peverell Park Villa, Plymouth; and G. K. Blatchford, Fairplace, Okehampton. Solicitors: Burges, Sloan, Ware & Scammell, 11, Marsh Street, Bristol.

Settle and District Electricity Co., Ltd.—Public company. Registered December 21st. Capital £50,000 in £1 shares. Objects:—To acquire from Messrs. Crompton Parkinson, Ltd., the benefit of the Settle and District Electricity Special Order, 1931, and to carry on the business of an electric lighting and power company in all its branches. The subscribers are:—A. P. Hollinshead, H. E. Walker, J. Farran, W. J. Hill, G. H. Woodcock, E. Domone and F. Hopton, of 2, Bond Court, Walbrook, E.C.4. Secretary: J. H. Roberts. Registered office: Cable Research House, Silver Street, W.C.1.

Submarine Signal Co. (London), Ltd.—Private company. Registered December 23rd. Capital, £1,000 in £1 shares. Objects: To carry on the business of electrical, mechanical, hydraulic, marine or submarine engineers, manufacturers of machinery, tool makers, instrument makers, metal workers and machinists, to acquire, construct, maintain and deal with aerial, land, marine and submarine telegraphs (including telephones and all other electrical or other contrivances for transmitting, receiving or recording signals or messages), &c. The subscribers are: C. P. Whitcombe, 8, Durward House, Kensington Court, W., and L. F. Stewart, 243, Kingston Road, Wimbledon, S.W. C. P. Whitcombe is first governing director and chairman. Solicitors: Slaughter & May, 18, Austin Friars, E.C.

Midgley Leighton, Ltd.—Private company. Registered December 23rd. Capital, £2,000 in 1,500 7½ per cent. preference shares of £1 each and 10,000 ordinary shares of 1s. each. Objects: To carry on the business of engineers formerly carried on by E. Leighton at Wembley as the Paragon Engineering Co., to acquire patents, rights, licences and concessions conferring the right to manufacture, sell and deal in any inventions relating to improvements in electrical apparatus for amplifiers, loud-speakers, sound-producing apparatus, musical instruments, &c. The first directors are: E. Leighton, 25, Northwick Park Road, Harrow, N.W.; A. H. Midgley, Tudor House, Priory Hill Avenue, Wembley; R. Leighton and H. Leighton, addresses not stated. Solicitors: Romain & Romain, 52, Baker Street, W.1.

Chester Electrical Co., Ltd.—Private company. Registered December 21st. Capital £500 in £1 shares. Objects:—To carry on the business of electrical, wireless and aircraft engineers, and machinists, agents for and dealers in electric vehicles, &c. The first directors are:—E. V. Price, 29, Upper Northgate Street, Chester; and G. W. Finch, 65, Bridge Street, Row, Chester. Solicitors: Jolliffe & Hope, 13, St. John Street, Chester.

Armoured Cable Co., Ltd.—Private company. Registered December 21st. Capital £550 in 500 ordinary shares of £1 and 1,000 founders' shares of 1s. each. Objects:—To carry on the business of manufacturers of and dealers in cables, chains, belts, wires, cords, conductors, turbines, boilers, engines, dynamos, motors and mechanical and electrical machinery, to lay cables, mains and conductors, &c. The subscribers are:—C. Russell, 52, Belgrave Road, Wanstead, E.11; and H. H. Pugh, 9, The Park, Ealing, W.5. Solicitors: Hutchison & Cuff, 6, Stone Buildings, Lincoln's Inn, W.C.2.

Peter Grassmann, Ltd.—Private company. Registered December 21st. Capital, £1,000 in £1 shares. Objects:—To carry on the business of manufacturers, importers and exporters of and dealers in all kinds of loud-speakers, gramophones, or any other sound-producing or musical instruments, wireless, television and electrical apparatus, &c. The directors are:—P. Grassmann (permanent governing director and chairman), Boothstr. 1, Berlin-Lichtenfelde, Germany; L. Holzman, Bury House, Wheathampstead, Herts (director, Louis Holzman, Ltd.); M. Holzman, 245, Chamberlayne Road, N.W.10 (director, Rotor Electric, Ltd.). Registered office: 2/3, Upper Rathbone Place, W.1.

Wigmore Radio Service, Ltd.—Private company. Registered December 23rd. Capital, £100 in £1 shares. Objects: To carry on the business of importers and manufacturers of, agents for and dealers in radio apparatus, &c. The directors are: P. K. de Gooreynd, Yew Place, Farnham Royal, Bucks, and H. A. Thompson, 39, The Byeways, Surbiton Hill Park, Surbiton, Surrey. Registered office: Aldwych House, Aldwych, W.C.2.

Manor Radio, Ltd.—Private company. Registered December 28th. Capital, £100 in £1 shares. Objects: To carry on the business of manufacturers of, agents for, and dealers in all kinds of radio instruments and accessories, electrical goods, musical instruments, &c. The subscribers are: S. Jarrett and Mabel I. Love, both of 17, Shaftesbury Avenue, W.1. The first directors are to be appointed by the subscribers. Solicitors: Stanley Jarrett & Co., 17, Shaftesbury Avenue, W.1.

Electrical Name & Numerical Sign Co. (1931), Ltd.—Private company. Registered December 28th. Capital, £100 in 1s. shares. Objects: To carry on business as electrical and mechanical engineers, sign makers, manufacturers of and dealers in electrical and wireless fittings, &c. The permanent directors are: E. G. Gibbons and G. H. Gibbons, both of 33, Ridge Hill, N.W.11. Registered office: 30, Little Newport Street, W.C.2.

Union Totalisator Co. (Overseas), Ltd.—Private company. Registered in Edinburgh on December 23rd. Capital, £100 in £1 shares. Objects: To carry on the business of suppliers of mechanical, portable, electrical, or hand-operated totalisators, &c. The directors are: J. N. Browne, 1, North Claremont Street, Glasgow; E. E. Wilson, 1, North Claremont Street, Glasgow. Registered office: 12, Renfield Street, Glasgow, C.2.

Walter Jameson, Ltd.—Private company. Registered December 18th. Capital, £500 in £1 shares. Objects: To carry on the business of mechanical, electrical and general engineers, workers in metals and other materials, manufacturers of optical goods, scientific and other instruments, &c. W. Jameson, Southern Bungalow, Hanging Hill Lane, Hutton, Essex, is the first director. Secretary: W. F. Miles. Registered office: The Parade, Brentwood.

Returns of Electrical Companies

Venner Time Switches, Ltd.—Debenture charged on the company's undertaking and property, present and future, including uncalled capital, but excluding the Sports Ground, Idminster Road, Worcester Park, dated November 17th (supplemental to charge dated April 20th, 1931, securing all moneys due or to become due from the company to the Westminster Bank Ltd.).

Electradio Co., Ltd.—S. Croft, 58, Coleman Street, E.C.2, ceased to act as receiver and manager on December 15th, 1931.

Cavendish Trading Co., Ltd.—Debenture dated December 8th, to secure £300, charged on the company's undertaking and property, present and future, including uncalled capital. Holder: N. H. Colson, 128, Piccadilly, W.1.

Kent Bros. Electric Wire Co. & E. H. Phillips, Ltd.—Satisfaction in full on December 15th, of debentures authorised August 20th, 1924, registered October 16th, 1924, and issued on various dates, securing £20,000.

Arnold Goodwin, Ltd.—Particulars filed of debentures for sums not exceeding £1,500 authorised November 26th, charged on the company's property, present and future, including uncalled capital, the amount of the present issue being £850.

K. G. Clark, Ltd.—Debenture, dated December 10th, to secure £1,000, charged on the company's undertaking and property, present and future, including uncalled capital. Holder: Mrs. E. A. Searle, 8, Hurst Road, Buckhurst Hill, Essex.

Pullars Electric Co. (Brighton), Ltd.—Further charge dated December 16th, to secure £650. Property charged: Property comprised in two charges dated July 1st, 1930, and September 1st, 1930, *viz.*, 105a, Hollingbury Road, Brighton, and also freehold premises in Hollingbury Road. Holder: R. Kelsey, Flat 4, No. 4, Third Avenue, Hove.

Voltron Electric, Ltd.—B. M. L. Fynn, of 1, Ironmonger Lane, E.C.2, and E. F. Norman, of 19 and 21, Queen Victoria Street, E.C.4, were appointed joint receivers and managers on December 11th, under powers contained in two mortgage debentures dated May 14th, 1931.

Hightensite & Ebonite Manufacturing Co., Ltd. (Old Company).—H. G. Judd, of 8, Frederick's Place, Old ewry, E.C.2, ceased to act as receiver and manager on December 14th.

Southern Electric Free Wiring Co., Ltd.—Capital, £5,000 in £1 shares. Return dated September 4th, 1931. 1,510 shares taken up. £1,510 paid. Mortgages and charges, nil.

Jersey Electric Lighting & Power Co., Ltd.—Capital, £65,000 in 51,000 preference and 14,000 ordinary shares of £1. Return dated August 31st, 1931. 12,257 preference and 14,000 ordinary shares taken up. £26,257 paid. Mortgages and charges, £9,000.

O. S. Choppin & Co., Ltd.—Capital, £1,000 in £1 shares. Return dated August 28th, 1931. 702 shares taken up. £2 paid. £700 considered as paid. Mortgages and charges, nil.

Colston Electrical Co., Ltd.—Capital, £4,000 in £1 shares. Return dated July 28th, 1931. 2,646 shares taken up. £1,146 paid. £1,500 considered as paid. Mortgages and charges, £1,000.

Vimax Machinery Co., Ltd.—H. R. Roynon, 664, High Road, Tottenham, was appointed receiver on December 18th, 1931, under powers contained in debenture dated August 11th, 1931.

City Notes

Benham & Sons, Ltd., held their annual meeting on December 21st. Mr. S. J. Benham (managing director), who presided, said that the net profit for the year was the fourth best in the 140 years of the company's history. At the beginning of the financial year he visited South Africa, and they had received several good orders. Their largest contract in hand in any country had been at the new Castle Harbour Hotel, Bermuda, where they secured, in face of American competition, a contract for heating, hot water supply, cooking apparatus and cooking utensils. Other good export orders included cooking apparatus and utensils, cold storage plant and ventilation for

the new Rock Hotel, Gibraltar, secured in competition with French firms, and cooking apparatus for the new Hotel Metropole, Shanghai. Their export business showed continued expansion. In this country they had installed more large kitchen equipments than in any previous year. These included the Mansion House, Fishmongers' Hall, Salters' Hall, Claridge's Hotel, and the new kitchens at Cannon Street station. They had also fitted up a number of hospitals and canteens. They were carrying out the heating and hot water supply at the Plymouth City Hospital, the whole of which, and most of the cooking apparatus, would be electrical. Their heating department had suffered rather more than the rest of the business from the general depression, and, while they had some good contracts in hand, there was very little private house work going on, and on other jobs they had to face severely cut prices for a lower standard of work than their own.

Yarrow & Co., Ltd., held their annual meeting on December 21st, Mr. H. E. Yarrow (chairman and managing director) presiding. In presenting the report and accounts (ELEC. REV., December 11th, p. 901), the chairman said the Boiler Department had been kept busy during the year with both marine and land boilers. Many noteworthy steamships had been equipped with Yarrow boilers, and installations totalling over 3,000,000 sq. ft. of heating surface had been adopted in the Merchant Service during the last four years. The new Cunarder was being equipped with the latest type of Yarrow high-pressure boilers, and a number of boilers for electric power stations and factories had recently been completed. With regard to new work, among the important orders received was one from the Admiralty for turbine machinery for two warships, and several orders for Yarrow boilers for power stations had been secured in different parts of the world, including India, South Africa and Finland. With the abnormal conditions prevailing at the present time and the various burdens imposed on industry it was impossible to visualise the future, but the company had sufficient work on hand to remain fairly well occupied until 1933, when it was hoped that more prosperous conditions would prevail. The report and accounts were adopted.

The Manaos Tramways & Light Co., in its report for the year ended April 30th last, states that the operating revenue was adversely affected by the fall in the sterling value of milreis, which necessitated the writing off of £12,323 for difference in exchange, resulting in an operating loss of £2,850, as compared with a net revenue of £7,987 in the preceding year. After providing for debenture redemption, London expenses, &c., and deducting interest, &c., received, there is a debit balance carried forward of £6,891. The report records the death of Mr. C. H. Julius, a director.

The Metropolitan Electric Supply Co., Ltd., held an extraordinary general meeting on December 24th, at which resolutions were carried authorising the capitalisation of £90,000, being part of the undivided profits standing to the credit of the special reserve fund of the company. The new capital will be distributed in the form of bonus shares to ordinary shareholders in the proportion of one share for every twenty-five held, the new shares to rank *pari passu* with the existing ordinary shares.

The Pernambuco Tramways & Power Co. reports a gross revenue for 1930 of £495,251, as compared with £528,548 in the preceding year. Working expenses were £318,864 (£316,370), leaving a net revenue of £176,387, to which is added interest and discounts, miscellaneous credits, &c., making £197,827. After deducting debenture interest, &c., there was a net loss of £20,792, as against a net profit of £33,929, which is deducted from the balance brought in (£117,661), leaving £96,869 to be carried forward.

Baird Television, Ltd., in its report for the year ended June 30th last states that the balance of £66,139, representing expenditure during the year after deducting gross trading receipts and other credits, has been transferred to the general development account, which now stands at £197,922. The report states that the British Broadcasting Corporation has initiated discussions with a view to more active participation in television transmissions.

Boulton & Paul, Ltd., report a net loss of £46,696 for the year ended September 30th last, as compared with a net profit of £25,807 in the preceding year. The balance brought forward is £32,390, to which is added £20,000 transferred from general reserve. After deducting the net loss there remains a credit balance of £5,695. The preference dividend is paid, and £3,195 is carried forward. For the previous year an ordinary dividend of 5 per cent. was paid.

Imperial and International Communications, Ltd., reports that the estimated traffic receipts for November were £427,062, as compared with £402,886 in November, 1930. The receipts for the eleven months ended November 30th were £4,387,606, as compared with £4,929,154 in the corresponding period of 1930, a decrease of £541,548. In comparing aggregates, allowance must be made for the changed conditions of sharing traffic.

Companies Struck off the Register.—The names of the undermentioned companies have been struck off the register and they are thereby dissolved:—

Baynton's Wholesale Wireless, Ltd.
Derwent Valley Electric Power Co., Ltd.
Silent Electric Clock Co., Ltd.
Super Wireless, Ltd.

International Hydro-Electric System has declared a quarterly dividend of $0.87½ per share on the preferred stock, convertible $3.50 series, and a stock dividend of 1/50th of a share of class "A" stock for each share of such class "A" stock held. Shareholders have the option of taking in lieu of stock, cash at the rate of 50 cents for each share held.

The Barcelona Traction, Light & Power Co., Ltd., reports that the net earnings for November of the companies operating independently in Spain in which the company is interested were 6,156,156 pesetas, as against 6,108,537 pesetas for the corresponding month of 1930. The aggregate net earnings for the period January-November, 1931, amounted to 63,915,546 pesetas, as against 64,029,171.

The British Vacuum Cleaner & Engineering Co., Ltd., report a profit for the year ended September 30th last of £14,982, as compared with £3,575 for the preceding year. After providing for depreciation and income tax, it is proposed to pay a dividend of 12½ per cent. (the first since 1919), and to carry forward £8,415 (£2,801). The report states that notwithstanding severe competition in the company's products and the general adverse conditions of trade, the business has been considerably increased.

The Westminster Electric Supply Corporation, Ltd., has announced its decision to capitalise the available balance of the special reserve and to issue it to ordinary shareholders in the proportion of one new share for every eight shares held. In view of rumours regarding the possibility of further bonus distributions by some of the London electricity companies, the board states that it has not under contemplation any such further distribution by the Corporation.

Agricultural & General Engineers, Ltd.—The three directors of the company and the seven directors of associated companies who requested an investigation into the affairs of the company by Sir Gilbert Garnsey have issued a statement welcoming the decision announced by the board to invite Sir Gilbert Garnsey to co-operate with Lord Plender in a thorough investigation of the company's affairs.

John Shaw & Sons (Wolverhampton), Ltd., report a net loss of £22,244 for the year ended June 30th last, as compared with a profit of £5,441 in the preceding year. The amount brought forward was £29,644, less the preference dividend for the half-year ended December 31st, 1930, and, after deducting the net loss, £3,532 is carried forward.

Greenwood & Batley, Ltd., announce an interim preference dividend of 3½ per cent., but the directors have decided to postpone consideration of payment of any dividend on the ordinary shares until the company's year is ended.

Berry's Insulating & Building Products, Ltd., reports a profit of £3,796, to which is added £2,393 brought forward, making £6,189. It is proposed to allocate £3,000 to the reduction of the cost of the issue of capital, and to carry forward £3,189.

The Montreal Light, Heat & Power Consolidated has announced a dividend of 38 cents per share on the common shares for the quarter ended December 31st.

W. & T. Avery, Ltd., have announced an interim dividend on the ordinary shares of 5 per cent., less tax (same).

Stocks and Shares

TUESDAY EVENING.

THE presentation of comparative lists of prices in any of the Stock Exchange markets for the year 1931 is not a particularly pleasant task, either for the chronicler or for the investor reader. The outstanding event of the twelve months, financially speaking, has been the suspension of the gold standard, which has led in its turn to severe contraction in the prices of fixed-interest stocks and shares. Officially, this took place on Monday, September 21st; actually, the Bank of England Court met the Treasury on the previous day, Sunday, September 20th, and decided upon a step which they took with the greatest reluctance, and under the pressure of forces too strong to be withstood. The drain of gold from this country had been proceeding at a rate which rendered inevitable the departure from the gold standard. The General Election brought into power a new Government, and, the Labour Party being buried under an avalanche of losses, the National Government, armed with unusually wide powers, has already produced certain anti-dumping legislation which has had an indirect influence in stimulating trade. It served to draw attention to shares in the electricity manufacturing companies, and to a number of others connected with the industry. But, on the whole, the gains which followed upon previous declines have not entirely wiped out the latter, and it will be observed from the following figures that equipment and manufacturing issues have suffered, in some cases severely, from abnormal circumstances:—

Share.	Dec. 30th, 1930.	Now.	Fall.
Babcock	49/6	46/3	3/3
British Aluminium	30/6	23/9	6/9
British Insulated..	3⅜	2⅜	15/–
Brush	105	70	35
Callender's	3½	2½	15/–
Enfield Cables	4 ⅛	3⅛	8/9
G.E.C.	2 ⅞	42/–	1/9
Henley's	5¼	4 ⅜	18/9
India Rubber	6/3	6/3	—
Johnson & Phillips	36/9	23/9	13/–
Siemens	21/3	20/–	1/3
Tel. Construction	16¼	12¼	4

The dividend announcements in respect of the foregoing companies have been, generally speaking, satisfactory, though it is felt that, in respect of the current financial year, profits are likely to show diminution.

Electricity Supply Shares

It may be recalled that at the end of last year the anomaly, as satisfactory as it was curious, was presented of shares in electricity supply companies showing a considerable number of rises instead of the lugubrious list of falls which characterised stocks and shares in other markets. During 1930, nine out of the following eleven examples had gains to their credit, the improvements being small, it is true, but none the less noteworthy on that account. This list of shares is remarkable for the steadiness which most of the prices display. Falls have taken place, but mostly of minor consequence. Three companies, Kensingtons, St. James's, and Londons, show rises on the year. The figures give the comparisons in the cases of the principal London companies:—

Ordinary share.	Dec. 30th, 1930.	Now.	Rise or Fall.
Brompton	27/6	27/6	—
Charing Cross	29/–	29/–	—
Chelsea	27/6	26/–	–1/6
City of London	36/3	35/–	–1/3
County	47/6	43/3	–4/3
Kensington	27/6	29/–	+1/6
London	32/6	33/–	+–/6
Metropolitan	42/–	37/6	–4/6
St. James'	28/–	29/–	+1/–
South London	27/–	25/6	–1/6
Westminster	29/–	28/–	–1/–

In the year which we are about to enter, the standard rate of dividend for the London electricity supply companies is to be fixed at 7 per cent. A number of the companies have already announced the partial capitalisation of reserve funds made in such manner as will prevent any material alteration in the income at present received by proprietors of the shares. Under the Act, it is possible that dividends may be increased, but any advance of this sort is not likely to be made, at any rate, for a year or two.

Traction Stocks

There is nothing consolatory to write concerning prices in the Home Railway market. The principal factor throughout the year in the group of Underground stocks has been the fluctuations in the fortunes of the London Passenger Transport Bill, the fate of which hangs even yet in the balance. The Metropolitan Railway reduced its interim dividend, but the members of the Underground Electric Railways of London group are expected to maintain their previous rates. This quartette of prices gives an indication of the way in which quotations have shrunk :—

Stock or share.	Dec. 30th, 1930.	Now.	Fall.
Central London	79	68½	10½
Metropolitan	68½	35½	33
Metropolitan District	77	60½	16½
Underground	24/6	19/–	5/6

British Electric Traction deferred at 700 is almost half the price, 1325, at which it started the year. Amongst foreign stocks, Anglo-Argentine Tramways have suffered severely, the 5 per cent. debenture stock at 12½ being 40 points down as compared with twelve months ago. Brazilian Tractions have declined from 21 to their present price of 14. South American countries have been in difficulties over their exchanges, and are still faced with the restrictions which these set upon business.

Cables and Wireless

The deferring of the dividend due last September on Cables and Wireless 5½ per cent. preference stock had the effect of reducing the price abruptly, and although it, and the two others in the same combine, stand above the lowest of the year, they show falls on balance. The preference at 47½ is 22½ points down as against the 47½ points which it lost during 1930 as compared with the end of 1929. Globe ordinary shares have fallen £5 on the passing of the last interim dividend. Great Northerns are nearly £10 lower, and the Anglo-American group has moved in the same direction. The comparisons are as follow :—

Stock or share.	Dec. 30th, 1930.	Now.	Fall.
Anglo-Amer. pref.	103½	92½	11
Cables & Wireless pref.	70	47½	22½
Cables & Wireless "A"	22½	17	5½
Cables & Wireless "B"	11½	10	1½
Globe ordinary	13	8	5
Gt. Northern	30	20½	9½
Marconi Marine	38/9	33/3	5/3

The tendency amongst telephone companies during the year has been towards amalgamation. American Telephone & Telegraph stock, which a year ago stood at 182½, is to-day quoted at 170, in spite of the fact that the departure of this country from the gold standard should have had a strengthening effect upon prices of all dollar issues. International Telephones at 14 have fallen 6½, in consequence of a reduction in the dividend.

The Prospects for 1932

Without any attempt to enter into competition with Old Moore, the prophet may yet be excused from venturing the opinion that the New Year is likely to prove a crucial time for British credit and British industry. Luckily, this country is a great deal better off than most of the nations of the world, nor does it require a great deal of special pleading to show that Great Britain's troubles may prove to be less than those of the United States and of France. Electrical development has suffered something of a check, it is well to recognise, through the economy policy initiated by the Government, which is likely to have its effect in the curtailment of electrical programmes previously in contemplation. This will mean no more, however, than that work may be expected to go forward rather less rapidly than would otherwise have been the case. The shares in the Home electricity supply companies are amongst the soundest investments that the commercial lists afford. The shares of the established undertakings in the electrical equipment and manufacturing branches stand as excellent securities of their kind, with prudent management and conservative finance to support their companies' trade in quiet days. What will happen abroad is a matter of greater speculation. Prices of foreign stocks and shares have descended to levels which look unduly low, and which would probably attract the attention of the speculative investor if he had the courage or the capital to take a hand in the markets. But with the income-tax collector knocking at the door he has none too much of either at the present time.

Share List of Electrical Companies

	Nom.	Approx. Dividend. 1929.	1930.	Price, Dec. 29, 1931.	Rise or Fall.	Yield p.c. £ s. d.
HOME ELECTRICITY COMPANIES						
Bournemouth and Poole		15	15	57/6	—	5 4 4
Brompton Ordinary		8½	8½	27/6	—	5 1 0
Central Electricity 4½% Deb. ..	Stock	—	4½	82½	—	5 9 1
Charing Cross Ordinary	1	8½	8½	29/–	—	4 16 7
Chelsea	1	8½	8½	26/–	—	5 7 8
City of London	1	10	10	35/–	—	5 14 3
Clyde Valley	1	8	8	30/9	—	5 4 1
County of London	1	11	11	43/3	—	5 1 7
Edmundsons' 7% Pref.	1	7	7	23/6	—	5 19 2
Elec. Supply Corporation	1	11	11	41/3	—	5 6 6
Kensington Ordinary	1	8	8	29/–	—	4 16 7
Lancs. Light and Power	1	7	6½	25/–	—	5 4 0
London & Home Counties 4½% Deb.	Stock	—	—	86	—	5 4 8
London Electric	1	8½	9	33/–	—	5 9 1
Metropolitan	1	9	10	37/6xd.	—	5 3 3
Midland Counties	1	6½	7	26/3	—	5 6 8
Mid. Elec. Power	1	15	8	28/9	—	5 11 4
Newcastle-on-Tyne Ordinary ..	1	6	6	23/3	—	5 3 3
Do. 7% Pref.	1	7	7	26/–	—	5 7 8
Notting Hill 6% Pref.	10	6	6	10½	—	5 14 3
North Met. Elec. 6% Pref. ..	1	6	6	22/6	—	5 6 8
St. James' and Pall Mall	1	8	8	29/–	—	4 16 7
Scottish Power	1	8	8	27/–	—	5 18 6
South London	1	8½	8½	25/6	—	5 9 8
Urban Ordinary	1	7	7	27/–	—	5 3 8
Westminster Ordinary	1	8½	8½	28/–	—	5 0 0
Whitehall Elec. Invst. 7½% Pref. ..	1	7½	7½	20/6	—6d.	7 6 4
Yorkshire Elec.	1	8	8	31/3	—	5 2 5
HOME RAILS						
Central London Ord. Assented ..	Stock	4	4	68½	—	5 16 10
Metropolitan	,,	4	3½	35½	–2	9 17 2
Do. District	,,	5	5	60½	–1	8 5 4
Underground Electric	1	8	8	19/–	—	8 8 6
TELEGRAPHS AND TELEPHONES						
Anglo-Am. Tel. Pref.	Stock	6	6	92½	—	6 9 9
Do. Def.	,,	1½	1½	22	—	6 16 4
Cables & Wireless 5½% Pref. ..	Stock	5½	5½	47½	+2	—
Do. A 7½% Ord.	,,	Nil	—	17	+1½	—
Do. B Ord.	,,	Nil	—	10	—	—
Globe Tel. and T. Ord.	10	10	8½	8	—	—
Do. do. Pref.	10	6	6	7½	—	8 5 6
Great Northern Tel.	10	20	20	20½	—	9 15 2
Marconi-Marine	1	15	15	33/3	—6d.	9 0 2
Oriental Telephone Ord.	1	12	12	2½	–½	*5 16 0
HOME AND FOREIGN TRAMS, ETC.						
Anglo-Arg. Trams First Pref. ..	5	5½	—	6/3	—	—
Do. do. 2nd Pref. ..	5	6	—	6/3	—	—
Do. do. 5% Deb. ..	Stock	5	5	12½	—	—
British Electric Traction Def. Ord.	,,	5	5	700	—	—
Do. do. Pref. Ord. ..	,,	8	8	112½	–2½	7 2 2
Brazil Traction	100	8	—	14	+½	—
Brit. Columbia Elec. Rly. Pce. ..	Stock	5	5	88	—	5 13 8
London & Sub. Trac. 5% Pref. ..	1	Nil	Nil	8/3	—	—
London United Tram Deb. ..	Stock	4	4	57½	—	6 19 2
Mexico Trams, 5% Bonds ..	—	5	5	35	—	14 5 8
Mexican Light Common	100	Nil	Nil	20	—	—
Do. 7% Pref.	100	7	7	25	—	20 0 0
Do. 1st Bonds	—	5	5	60	–2	8 6 8
Victoria Falls Ord.	1	15	15	55/–	—	5 9 1
Yorkshire (West Riding)	1	Nil	Nil	6/3	—	—
MANUFACTURING COMPANIES						
Assoc. Elec. Ord.	1	6	6	1	—9d.	6 0 0
Do. Pref.	1	8	8	27/6	—	5 16 5
Babcock & Wilcox	1	15	14	46/3	—	*6 2 0
British Aluminium Ord.	1	10	10	23/9	–¼	8 8 5
British Insulated Ord.	1	15	15	2½	—	5 14 3
Brush Ord.	Stock	10	5	70	—	7 2 10
Callender's	1	15	15	2½	—	6 0 0
Do. 6½% Pref.	1	6½	6½	23/9	—	5 9 5
Crompton Parkinson Ord. ..	5/–	30	30	20/–	—9d.	7 10 0
Do. 8% Pref.	1	8	8	26/3	–¼	6 2 0
Edison-Swan 1st Pref.	1	7½	7½	23/3	—	6 9 0
Do. 5% Deb.	Stock	5	5	91½	—	5 9 3
Electric Construction	1	5	Nil	10/–	—	—
Enfield Cable Ord.	1	25	25	3½	—	6 8 10
English Electric	1	Nil	Nil	7/6	—	—
Do. do. Pref.	1	Nil	Nil	7/6	—	—
Ferranti Pref.	1	7	7	21/3	—	6 11 9
G.E.C. Pref.	1	6½	6½	23/–xd	—	5 13 1
Do. Ord.	1	14	10	42/–	—	4 15 3
Henley's	1	30	30	4	–¼	6 1 5
Do. 4½% Pref.	5	4½	4½	4	—	5 12 6
India-Rubber	1	Nil	Nil	6/3	—	—
Johnson & Phillips	1	10	10	23/9	—	8 8 5
Siemens Ord.	1	7½	7½	20/–	—	7 10 0
Telegraph Construction	12	10	7½	12½	—	7 4 0

* Dividends paid free of Income Tax.

Published Specifications

Compiled expressly for this journal by a firm of chartered patent agents. The numbers in parentheses are those under which the specification will be printed and abridged, and all subsequent proceedings will be taken.

1930

16,665. "Tapping device for step transformers with a stepless regulating transformer having a divided energising winding." Koch & Sterzel Akt.-Ges. May 31st, 1929. (362,438.)

17,069. "Electrically operated type composing systems and apparatus." Teletype Corporation. June 5th, 1929. (362,370.)

22,124. "Gaseous electric discharge devices." British Thomson-Houston Co., Ltd. July 27th, 1929. (362,346.)

22,211. "Gaseous electric discharge devices." British Thomson-Houston Co., Ltd. July 27th, 1929. (362,347.)

22,385. "Thermionic valves." Lissen, Ltd. (in liquidation), J. E. Clark and F. W. Kennedy. July 24th, 1930. (362,373.)

22,854. "Remote-controlled electric shunting locomotives." L. Mellersh-Jackson (Siemens-Schuckertwerke Akt.-Ges.). July 29th, 1930. (362,443.)

23,045. "Electrical transmission devices." A. D. Blumlein. July 30th, 1930. (362,472.)

23,219. "Thermionic tubes." Standard Telephones & Cables, Ltd. (W. T. Gibsen and A. H. Boulestreau). August 1st, 1930. (362,374.)

23,666. "Method of and apparatus for electrically welding tubing." A. E. White (Clayton, Mark & Co.). August 7th, 1930. (362,477.)

23,724. "Trunk communicating installation with harmless cross talk." Siemens & Halske Akt.-Ges. August 23rd, 1929. (362,478.)

25,238. "Electric signalling apparatus." Relay Automatic Telephone Co., Ltd., British Power Railway Signal Co., Ltd., and R. Mordin. August 23rd, 1930. (362,444.)

25,583. "Apparatus for switching out faulty electric line sections." Siemens-Schuckertwerke Akt.-Ges. August 29th, 1929. (362,355.)

25,612. "Control of the phenomena in electric circuits." V. P. Wologdin. August 27th, 1930. (362,377.)

25,851/2. "Electric remote control systems." Siemens Bros. & Co., Ltd., and H. E. Humphries. August 29th, 1930. (362,484/5.)

26,064. "Electric supply systems." L. Burn. September 1st, 1930. (362,488.)

26,100. "Current limiting device for rectifiers." H. G. Davis and H. V. Clark. September 1st, 1930. (362,364.)

26,217. "Electric sound reproducing and recording apparatus." H. E. Holman and P. W. Willans. September 2nd, 1930. (362,494.)

26,237. "Remote control systems." Automatic Telephone Manufacturing Co., Ltd., G. Burns and P. F. Gunning. September 2nd, 1930. (362,495.)

26,238. "Electric connections of the plug-and-socket type." Berliner Physikalische Werkstatten Ges. March 29th, 1930. (362,385.)

26,394. "Duplex telegraphy." Creed & Co., Ltd., and R. G. Griffith. September 4th, 1930. (362,452.)

26,417. "Make-and-break mechanism of ignition magnetos." Fabbrica Italiana Magneti Marelli. September 5th, 1929. (362,454.)

26,471. "Means for reducing the switching-off time of power switches." Siemens-Schuckertwerke Akt.-Ges. December 17th, 1929. (362,459.)

26,593. "Transmission efficiency controlling arrangements for electric wave transmission systems." Electrical Research Products, Inc. September 12th, 1929. (362,502.)

26,616. "Method and means for increasing the power output of a thermionic tube." Revelation Patents Holding Co. September 21st, 1929. (362,504.)

26,669. "Electric supply arrangements for supplying apparatus with electric power from either alternating or direct current mains." Electrical Research Products, Inc., H. J. P. Jeffcock and C. H. F. Grotefeld. September 6th, 1930. (362,508.)

26,670. "Electrical induction motors." Electrical Research Products, Inc., I. S. Fraser and E. N. Johnson. September 6th, 1930. (362,509.)

26,671 "Multi-contact electric switching devices." Electrical Research Products, Inc., R. J. P. Jeffcock and C. H. F. Grotefeld. September 6th, 1930. (362,510.)

26,672. "Switching arrangements for electric condensers." Electrical Research Products, Inc., F. W. Wort and C. J. P. Small. September 6th, 1930. (362,511.)

26,690. "Electric signalling apparatus." J. Robinson and British Radiostat Corporation, Ltd. September 6th, 1930. (362,514.)

26,706. "Coin-freed electric shocking devices." E. Thompson. September 6th, 1930. (362,515.)

26,707. "Electric thermostats." L. Satchwell. September 6th, 1930. (362,516.)

27,091. "Wireless telegraphy and telephony." W. B. Mackenzie, W. F. Rawlinson and R. L. A. Borrow. September 10th, 1930. (362,530.)

27,296. "Electric sockets." J. Y. Johnson (Arrow-Hart & Hegeman Electric Co.). September 12th, 1930. (362,533.)

27,335. "Electric compensator for the directional transmission or reception of wave energy." Electroacustic Ges. May 20th, 1930. (Addition to 360,565.) (362,534.)

27,463. "Radio receiving sets and radio-gramophones." Oliver Pell Control, Ltd., and C. Oliver. September 15th, 1930. (362,536.)

27,498. "Gaseous discharge devices." British Thomson-Houston Co., Ltd. September 13th, 1929. (362,538.)

27,609. "Electrical transmission gearing." W. P. Tobler. September 18th, 1929. (362,541.)

28,430. "Sound reproducing systems." Sparks-Withington Co. October 5th, 1929. (362,554.)

28,461. "Overhead line with oscillation dampers." Siemens-Schuckertwerke Akt.-Ges. April 11th, 1930. (362,555.)

28,878. "Microphones." A. Weghofer. September 26th, 1930. (362,561.)

28,892. "Electrical ignition apparatus." H. S. Cowx. September 26th, 1930. (362,562.)

28,916. "Electric control systems for elevators and the like." British Thomson-Houston Co., Ltd. September 26th, 1929. (362,563.)

29,248. "Electric switches or jacks." Igranic Electric Co., Ltd., and Z. M. Jackson. September 30th, 1930. (362,571.)

29,733. "Process and apparatus for carrying out electrolytic processes, more particularly those with decomposable end products, such as, for instance, the manufacture of persulphuric acid or of its salts by electrolysis." Oesterreichische Chemische Werke Akt.-Ges. February 20th, 1930. (362,579.)

30,123. "Electric water heaters." W. E. Baron. October 8th, 1930. (Cognate application 11,460-31). (362,584.)

30,381. "Loudspeaker horn." A. I. Abrahams. October 10th, 1930. (362,589.)

30,417. "Electrical insulators." Hermsdorf - Schomburg - Isolatoren Ges. October 11th, 1929. (362,590.)

31,535. "Electrical igniter adapted also for use for pyro-engraving, thermo-cauterising, and similar purposes." E. Moulin. October 23rd, 1929. (362,599.)

32,401. "Method of electroplating metal alloys containing chromium." Wurttembergische Metallwarenfabrik. November 27th, 1929. (362,608.)

33,291. "Electric regulators." British Thomson-Houston Co., Ltd. November 9th, 1929. (362,613.)

33,564. "Synchronous motors." British Thomson-Houston Co., Ltd. November 9th, 1929. (362,618.)

34,062. "Electron discharge devices, particularly gas-filled rectifying tubes." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. January 22nd, 1930. (362,627.)

34,434. "Constant current variable voltage electric generating systems." G. Austin, J. C. MacFarlane, and W. A. MacFarlane. November 15th, 1930. (362.631.)

34,586. "Condenser telephone transmitter apparatus." F. B. Dehn (Jenkins & Adair, Inc.). November 17th, 1930. (362,639.)

35,578. "Electric totalisators." Ericsson Telephones, Ltd., F. Limb, and C. W. Wilman. November 26th, 1930. (362,654.)

36,064. "Electric dry-cell battery and seal therefor." C. P. Deibel. September 11th, 1930. (362,659.)

36,675. "Make-and-break device for electrical ignition apparatus." R. Bosch Akt.-Ges. January 3rd, 1930. (362,664.)

37,383. "Modulating systems for wireless and like signalling." Kolster-Brandes, Ltd. (Wired Radio Inc.). December 11th, 1930. (362,672.)

37,942. "High-tension electric cables." Siemens Schuckertwerke Akt.-Ges. March 3rd, 1930. (362,681.)

38,121. "Electric fires." H. H. Berry and G. J. Berry. December 17th, 1930. (362,686.)

38,234. "Thermionic valve amplifiers." I. Shoenberg and W. H. Connell. December 18th, 1930. (362,687.)

38,613. "Gas-filled thermionic valves." Telefunken Ges. für Drahtlose Telegraphie. December 21st, 1929. (362,699.)

39,124. "Loud speakers." H. A. H. Schuler. September 5th, 1930. (362,704.)

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164. "Electric heating and cooking apparatus." I. T. Stokes and A. G. Ionides. January 2nd, 1931. (362,713.)

641. "Electrical accumulators." Britannia Batteries, Ltd. January 7th, 1930. (362,719.)

1,548. "System for the optical recording of electrical oscillations." Kolster-Brandes, Ltd. (Kolster Radio Corporation). January 16th, 1931. (362,731.)

1,715. "Headlamps of motor vehicles." R Rockendorf. January 19th, 1931. (362,733.)

3,490. "Electrodes for electrolytic processes." E. Conradty and O. Conradty (trading as "C. Conradty"). July 23rd, 1930. (362,755.)

3,493. "Electrodes for electrolysis and methods of making same." E. Conradty and O. Conradty (trading as "C. Conradty"). February 3rd, 1931. (362,756.)

8,204. "Devices for feeding wires to machines for making electric incandescent lamps or the like." General Electric Co., Ltd. May 2nd, 1930. (362,803.)

10,821. "Electrically driven sewing machines." Mundlos Akt.-Ges. and R. Mundlos. April 13th, 1931. (362,818.)

14,078. "Radio receivers." Soc. Francaise Radio-Electrique. May 12th, 1930. (Addition to 347,629.) (362,829.)

19,391. "Production of metallic magnesium by electro-thermic reduction of magnesium compounds." Oesterreichische Amerikanische Magnesit Akt.-Ges. August 4th, 1930. (362,835.)

20,448. "Electromagnetic pickups." H. Sachs. July 21st, 1930. (362,836.)

22,185. "Photo-electric cells." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. September 30th, 1930. (362,838.)

Trade Mark Applications

THE following are among the recent applications for British trade marks. Objections against any of the proposed marks may be entered within one month from December 23rd :—

Midas. No. 526,095. Class 6. Cinematograph motors and film rewinding machines.—Cam Syndicate, Ltd., 46, Basinghall Street, E.C.2.

Antibrase. No. 527,295. Class 6. Machine pulleys and parts of machinery.—General Electric Co., Ltd., Magnet House, Kingsway, W.C.2.

Marconi. No. 509,515, and C. Marconi (lettering and globe design). No. 509,514. Class 8. Radio-telephonic receiving sets and loudspeakers, all for use in wireless broadcast reception and public address apparatus.—Marconiphone Co., Ltd., Blythe Road, Hayes, Middlesex.

Silverknights. No. 527,332. Class 8. Primary batteries.—India Rubber, Gutta Percha, and Telegraph Works Co., Ltd., Aldwych House, W.C.2.

N.S.F. (lettering and design). No. 524,990. Class 2. Radio-telephonic and telegraphic apparatus, television apparatus, sound-reproducing apparatus, and radio apparatus in combination with gramophones, and parts thereof.—Nürnberger Schraubenfabrik und Facondreberei Gesellschaft, Germany. (British representatives, Gee & Co., 51-52, Chancery Lane, W.C.2.)

Castle (lettering and design). No. 523,915. Class 39. Vulcanised fibre.—Vulcanised Fibre, Ltd., Broadford Mills, Shalford, Surrey.

New Work for Contractors

Particulars of new works and building schemes for the use of electrical installation contractors and traders

Publication in this list is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Alexandria (DUMBARTONSHIRE).—Houses (150), Admiralty site; county surveyor.

Ampthill (BEDS).—Houses (36) for the R.D.C.; surveyor.

Ashford (KENT).—Printing works, Park Street and High Street; W. R. Geering.

Aylesbury.—Loudspeaker factory, Great Western Street; Capt. Trouton, Cuddington.

Ayrshire.—Gymnasium, St. Michael's College, Irvine, with electrical work, for the C.C.; W. Reid, county architect, 14, Wellington Square, Ayr.

Beaconsfield (BUCKS).—Houses (44), Amersham Road site, for the U.D.C.; J. H. Crosby, surveyor. Church senior schools (£6,000); Messrs. Mead, builders, Chesham.

Billingham-on-Tees (DURHAM).—Branch library for the county E.C.; F. Willey, architect, 34, Old Elvet, Durham.

Blackpool.—Hospital, Whinpark Avenue; trustees, Victoria Hospital. Alterations to the Palatine Hotel; Atherton Bros. (Blackpool), Ltd., builders, Peter Street.

Blaydon-on-Tyne.—Branch premises, Scotswood and Denton Burn areas, for the Co-operative Society.

Bradford.—St. Peter's Church, Laisterdyke, with lighting and heating work; Holtom & Fox, architects, Union Street, Dewsbury.

Brechin.—Houses for the Corporation (electric lighting); burgh surveyor.

Brighton.—Houses (44), Carlton Hill area (£10,670); borough engineer.

Bromley (KENT).—Cinema for Living Picture Palaces, Ltd.

Cheltenham.—Houses (58), St. Mark's Estate (£19,999); A. F. Houfton & Co., Ltd.

Clacton-on-Sea (ESSEX).—R.C. schools; priest-in-charge.

Condorrat (GLASGOW).—Houses (28); county surveyor, Dumbarton.

Crawley Down (SUSSEX).—Development of Grange Estate for residences; A. T. Underwood, Three Bridges.

Croydon.—Houses (140) and flats (£67,000), Waddon, for the T.C.; borough engineer.

Denton (LANCS).—Re-erection of upholstery works for H. W. and C. Roberts.

Derby.—Schools, Normanton & Allenton, for the borough E.C.; director of education.

Derbyshire.—Medical superintendent's residence, Mickleover Mental Hospital, for the C.C.; county architect, Derby.

Dewsbury.—Market hall (£14,000), for the T.C.; T. Blakeley, borough architect.

Durham.—Extensions to St. Oswald's School (£2,000); T. Coates, builder, Hallgarth.

Felling-on-Tyne.—Reconstruction of cinema; J. Adams, architect and surveyor, Durham.

Forfar.—Picture house for the Kirriemuir Cinema Co.; W. B. D. Keith, architect, Dundee.

Gateshead-on-Tyne.—Methodist church; S. J. Stephenson, architect, 2, Saville Place, Newcastle.

Glasgow.—Houses (534), Hillhead Farm Estate; housing director. Buildings, St. Enoch Square (£20,000); city engineer. Picture house (1,200 seats), for Calder Picture House, Ltd.; Govanhill; Cowieson's, Ltd. Shops, Todd Street, Haghill; Logan, M'Cormack & Brown. Extensions to Knightswood Estate; Queensborough Engineering Co. Reconstruction work at Southern General Hospital for the Corporation (£12,000); city architect.

Hartshorne and Seals (BURTON-ON-TRENT).—Housing scheme, four parishes, for the R.D.C.; G. Farmer, clerk, Ashby-de-la-Zouch.

High Wycombe (BUCKS).—Bazaar premises, Church Street, for F. W. Woolworth & Co., Ltd., Kingsway, London. Houses (20), Hatters Lane, for W. A. Hazell.

Huddersfield.—Roebuck Memorial Rest Homes; Stocks, Sykes and Hickson, architects, 4, St. Peter's Street.

Ilford.—Houses (64), Oak Drive; E. Meredith. Houses (40), Vista Drive; P. G. Ashton & Sons. Boiler and engine house, Uphall Road; Howards & Sons, Ltd. Coach works, Cranbrook Road, and 56 houses, Queensborough Gardens; T. Anders. Factory for B.I.M., Ltd., Roden Road; H. Potter. Four shops, Eastern Avenue; Seymour Construction Co., Ltd. Shops, Victoria Parade, Cranbrook Road; Suburban Developments, Ltd. Extensions of Gearies School for the E.C.

Irish Free State.—(SLIGO).—Installation of electric lighting at Mental Hospital, for the Committee of Management; D. McAteer, consulting engineer, 17, Upper Merrion Street, Dublin.

Kendal.—Public abattoir, Sandylands, for the T.C.; F. W. Oxberry, borough surveyor.

Lanarkshire.—Houses (62), Blantyre, for the C.C.; county surveyor, Glasgow.

Leadgate (DURHAM).—Houses (80) for the U.D.C.; surveyor.

London.—(BATTERSEA).—Reconstruction of premises, St. John's Road; Arding & Hobbs, Ltd. (EAST HAM).—Alterations to 245, High Street North; Parnall & Sons, Ltd. (FULHAM).—New buildings, 298-302, North End Road; A. E. Batzer. (LEWISHAM).—Development of Northbrook Estate; Farebrother, Ellis & Co. Shelters and balconies for cinema, Loampit Vale; W. E. Trent. (PADDINGTON).—Buildings for Great Western Railway, Waverley Road; P. E. Culverhouse.

Malmesbury (WILTS).—Houses (32), Corn Gastons site, for the T.C.; borough surveyor.

Malpas (CHESHIRE).—Houses (30) for the R.D.C.; surveyor.

Mansfield.—Extensions to factory, Redcliffe Road; Forster, Clay & Ward.

Newcastle-on-Tyne.—Houses (55), Addycombe Terrace; Marshall & Tweedy, architects, 129, Pilgrim Street. Houses, High Heaton Estate, for the T.C. (£3,128); D. Gourlay & Co., Shield Road. Garage and showroom, Northumberland Street, for Rossleigh, Ltd.; Cussings, Ltd., St. Mary's Place. Church, Monkchester Road; parish priest, St. Lawrence's R.C. church. Radium institute (£21,000) in connection with Cancer Campaign; Newcombe & Newcombe, architects, 23, Eldon Square. Shops and houses, Shields Road; Liddle & Baxter, Eldon Square. Shops and houses, West Road, for Craigie & Graham; S. J. Stephenson, 2, Saville Place.

North Riding.—School, Redcar, for the C.C.; county architect, Northallerton.

Orrell (NR. WIGAN).—Police station; S. Wilkinson, county architect, 16, Ribblesdale Place, Preston.

Oswestry (SALOP).—Houses (27) for the T.C.; H. Hughes, builder, Acrefair, Wrexham.

Paignton.—Houses (36), Maidenway Road; Dr. Distin. Cinema, Torquay Road; R. M. Ely & Co.

Perth.—Houses (226) for the Corporation; burgh surveyor. New block (48 beds) for the City and County Royal Infirmary; J. C. Cameron, secretary to the Infirmary Board.

Peterborough.—Isolation hospital extensions for the T.C.; W. H. A. Court, city engineer.

Portsmouth.—Abattoir (£50,000) for the T.C.; borough surveyor.

Preesall.—Housing scheme, Smithy Lane; U.D.C. surveyor.

Preston.—Fire station and firemen's dwellings, St. George's Road, for the Corporation (£28,250). United Methodist church, Broughton; trustees. Extension of school, Ribbleton; rector, Blessed Sacrament R.C. church.

Purley.—Congregational church, Sanderstead Hill, for the trustees; T. E. Evans.

Rawtenstall (LANCS).—Bakery extensions, Standfield Road; R. B. Seville, Ltd. Extensions to omnibus depôt, Longholme Meadow; borough engineer.

Ripon.—Development of Building Estate, Kirkby Road; Mr. Hall. Reconstruction of premises, Low Skellgate; Messrs. Glovers.

Shipley.—Houses (46), Low Ash Road; R. Blackmore. Houses (164), Wrose Road Estate; Claremont Land Development Co., Ltd.

Southend-on-Sea.—Waxwork exhibition, Pier Head, for Louis Tussaud, Harrow. Strict Baptist church, Redcliff Drive, Leigh; secretary.

South Shields.—Bakery for W. H. Parker; H. Hill, 10, Winchester Street.

Stirlingshire.—Special school, Stirling, for E.C. (£28,100); master of works, Education Committee, Stirling.

Stoke-on-Trent.—Development of estate, Sheldon New Road; G. H. Broad, builder.

Walsall.—Extensions, Whitehall schools (£3,765), for the borough E.C.; J. R. Deacon, builder.

Waterlooville (HANTS).—Development of Hart Plain Estate (1,000 houses); Scarrott & Co., Southsea.

West Hartlepool.—School; rector, St. Joseph's R.C. church.

Fused Silica

The exceptionally high insulating properties of fused silica were discussed by Mr. R. W. Clark, A.M.I.E.E., at the Science Museum, South Kensington, in the course of a recent lecture on what he described as "The Supreme Glass: Fused Silica." He pointed out that pure quartz produced a transparent, colourless glass, whilst quartzite (owing to the occluded water in chemical combination with, and practically inseparable from, the crystals) gave a translucent or more or less opaque white glass.

The latter, for electrical purposes, is quite as valuable as the more expensive transparent type of fused silica glass. Pure silica in either form will only fuse at temperatures round about 1,750 deg. C., the usual procedure being to imbed in the quartz a carbon electrode for the transmission of the current. By this means the crystalline formation is nearly completely broken up and the silica is fused, becoming semi-liquid, when it can be drawn out into rods or tubes, or blown by compressed air into moulds. (It may incidentally be mentioned that in America optical lenses of unusual diameters have been built up by fusing the silica electrically at abnormally high temperatures, the fused silica falling down in a fine rain, the growing disc being kept in a semi-molten condition during the process. The second largest lens in the world has been successfully produced in this way by the General Electric Company, of America.)

To return to the lecture: the chief qualities for which silica glass is esteemed for scientific and industrial purposes are (1) its exceptionally high fusing point, which enables it to withstand very high temperatures; (2) its stability under wide changes of temperature, so that a fused silica tube may contain a cold liquid or gas and be surrounded by liquid or gas at high temperature, or *vice versa*; (3) practical non-contraction, expansion or elongation under changes of temperature; (4) resistance to attack by acids; (5) high transmission of the ultra violet rays; (6) high resistance to the electric current. Mr. Clark showed that while the resistance of the best porcelain is equal to 800 megohms to the cu. cm., that of fused silica is 900.

Among other things fused silica glass is being largely used for sheathing high induction coils, and is found to be most serviceable in high-frequency wireless transmission work. For this purpose considerable quantities of fused silica glass sheathing produced in England is being exported to the United States.